

MODERN Machine Shop

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MODERN MachineShop

CINCINNATI, OHIO

SEPTEMBER, 1929

VOL. 2, No. 4

P. & L. E. Shops Are Equipped With Modern Tools

By HOWARD CAMPBELL

THE equipment of the Pittsburgh & Lake Erie shops, at McKees Rocks, Pennsylvania, not only includes a large number of metal-working machines of the most modern type, but also includes a variety of ingenious tools and devices which have been designed and built in these shops.

Among the latter is the "unit-puller," illustrated in Fig. 1, with which the laborious task of removing the superheater units from the engine is reduced to a mechanical operation. The puller consists of two side frames of 10 x 2½-inch channel iron, joined together and braced by angle iron sections, and carrying a winch which

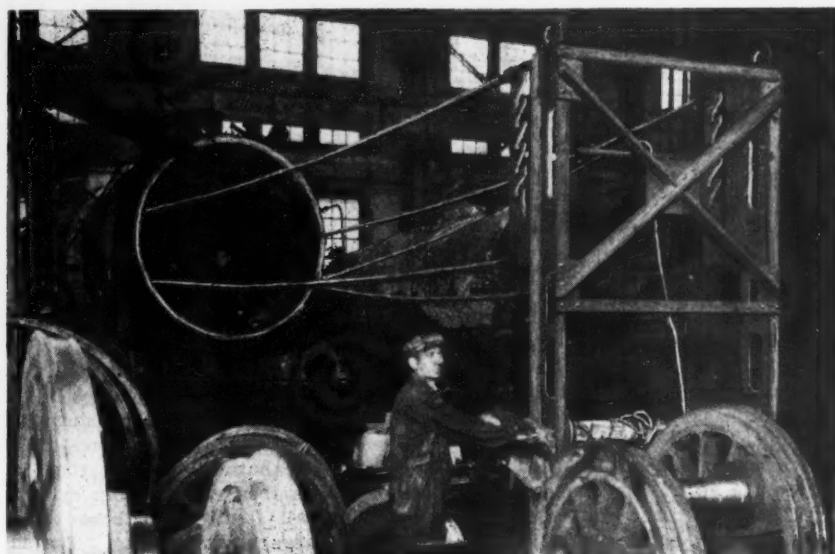


Fig. 1—Superheater units are removed from the engine by power.

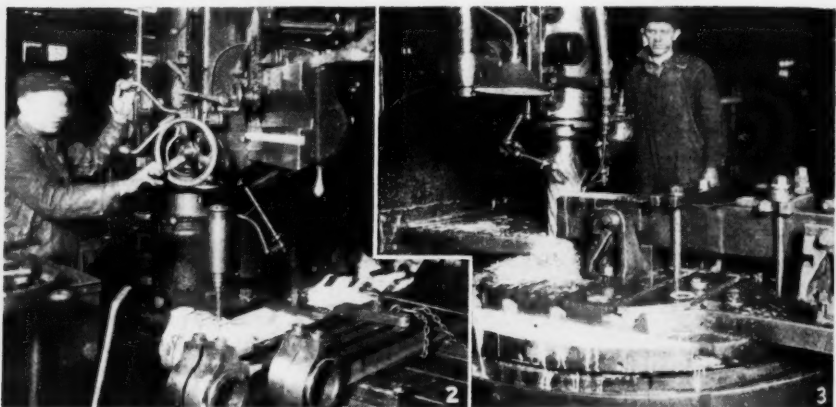
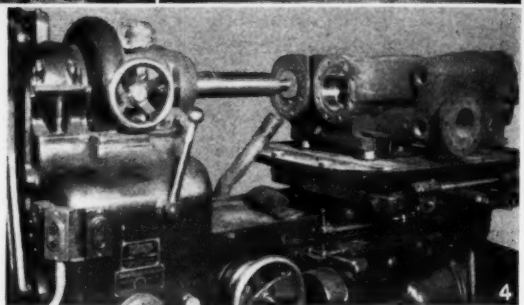


Fig. 2—Drilling out worn grease cup holes in side rods for re-bushing. Fig. 3—Milling guides, using an inserted-tooth spiral cutter in a vertical milling machine. Fig. 4—Grinding bores in a cylinder casting for a feed water pump, using a Micro grinder.



is operated by an air motor. When ready to operate, the puller is braced to the front end of the engine by four long sections of 2-inch steel tubing which are bolted in place as shown in Fig. 1.

The superheater unit is pulled out by means of a steel cable, one end of which is attached to the unit with the other end passing over a pulley and downward to the winch. The pulley shaft is supported by vertical side pieces of heavy steel in each of which is five slots that provide for adjustment according to the height of the engine or the rows of flues. The air motor is geared to the winch through a set of compound gears which makes it possible for the motor to provide all the power necessary.

When the grease cup holes in side rods become badly worn, they are drilled out and tapped for the cups.

This operation is performed with the aid of the radial drill press shown in Fig. 2, where the operation of drilling the old holes out for the bushings is shown in process.

Another nice piece of equipment is the large vertical milling machine illustrated in Fig. 3. The machine is shown in use for milling off the ends of guides. A spiral inserted-tooth cutter is used on this operation.

One of the busiest machines in the shop is the Micro grinder, shown in operation in Fig. 4. The operation in process is that of grinding the four bores in a feed water pump cylinder casting, all four of the bores being ground at a single setting. The advantages of this method over the

older methods of machining these cylinders are obvious; not only is the ground hole a better job, but the holes are finished perfectly square with each other and the time saved on re-

can be swung out of the way when other tools on the turret are used. Micrometer adjustment is provided to the tool slide and the two roller slides, and the bearing on the taper guide bar also is provided with micrometer adjustment so that all slides are adjusted simultaneously.

When a bolt is completely turned, the cutting tool is prevented from making a mark on it by a lever, located above the guide bar, which drops into position and keeps the cam from returning to its operating position until the turret has been returned to the end of the bar.

Cylinder heads are polished by the use of an air motor, which is

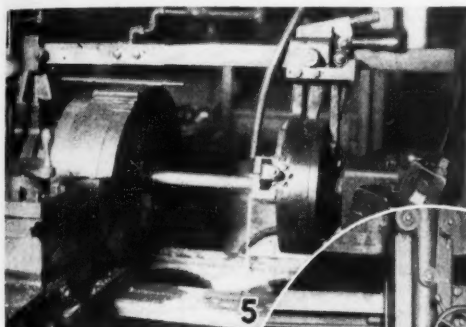
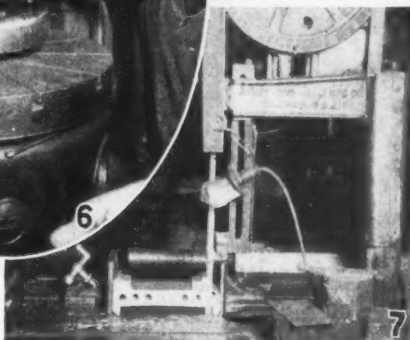


Fig. 5—Tapers on rods and bolts can be turned with this turret lathe and attachment. Fig. 6—Polishing a cylinder head, using an air motor and boring mill. Fig. 7—Journal gages are shaped up in the block, and are then sawed off in the band saw.

setting alone is a large item. The machine is provided with attachments for grinding links, air pumps, bearing holes in side rods, and other parts.

A turret lathe with an attachment which makes it possible to turn tapers on shafts and bolts is shown in Fig. 5, in process of turning a taper of $\frac{1}{16}$ -inch to the foot on a rod bolt. The taper mechanism is controlled by a taper guide bar, which is mounted on the headstock. The guide bar passes through the upper part of the taper turning tool and operates a cam, which in turn moves the cutting tool and rollers out, causing them to turn a taper. The taper guide bar is mounted on a pivot and



held in the toolholder of a boring mill as shown in Fig. 6. A cut is taken across with a grinding wheel first, followed by a cut with a polishing wheel. The tool is fed across by the machine, and a nice job is produced.

Among the machines which are coming to the front as modern machine shop equipment is the metal

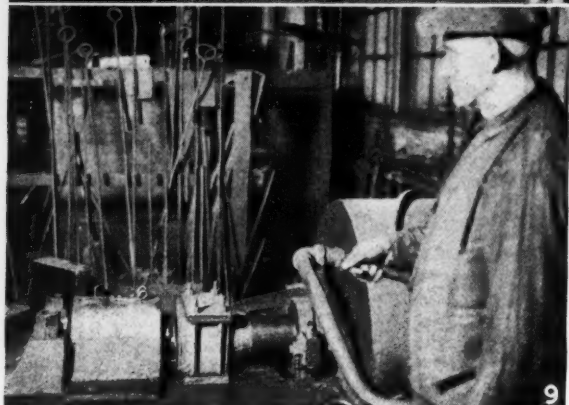
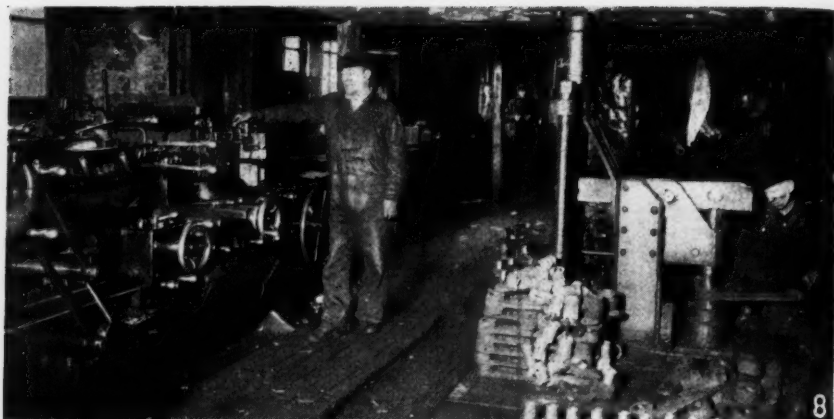


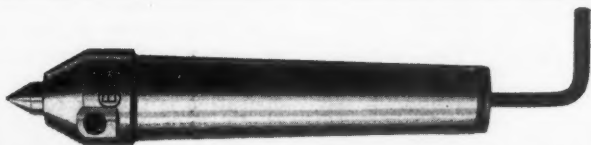
Fig. 8—Equipment for re-bushing spring hangers. Fig. 9—Reclaiming coil springs. This machine spreads them to the correct length.

cutting band saw. Such a machine is in constant use in this shop for all sorts of cutting-off jobs, such as cutting off $4\frac{3}{4}$ -inch hexagon nuts for engine pumps, cutting off the ends of shoes and wedges, and so on. The machine is shown in Fig. 7, cutting off journal gages from a solid block which has been machined to the necessary shape and dimensions. The saw cuts continuously while in operation, and the machine stops immediately when the cut is finished.

The illustration Fig. 8 shows a corner of the shop in which the equip-

ment for re-bushing spring hangers is located. The pins and bushings are made in the turret lathe at the left, and the disassembling and assembling of the bushings to the hangers is handled with the press shown at the right. The press was made in this shop and is operated by air pressure, but the air is applied through a water cylinder so as to prevent the press from operating too fast. The press is shown in operation, pressing a worn bushing out of a spring hanger.

Coil springs that have lost their resiliency are reclaimed by spreading to the correct length and clearance between coils and then tempering. They are first heated to forging heat, then they are spread in the machine shown in operation in Fig. 9, one end of the spring being clamped in the stationary bracket at the left while



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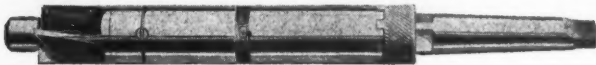




Fig. 10—Adjusting the coils to the proper clearances.

the other end is clamped in a bracket that is attached to the end of the horizontal piston rod. When air is applied to the cylinder, the rod pulls the spring out to the desired length. The spring is then placed between the angle plates on the table shown in Fig. 10, which are set to the correct distance apart, and the mechanic spreads the coils to a uniform and correct dimension with a hand tool. The spring is now heated to approximately 1,600 degrees F. and tempered in oil, after which it is "drawn" to from 700 to 800 degrees. The oil is kept down to a temperature of not more than 275 degrees by the use of a circulating water system.

No department of the shop has been overlooked in the modernizing of equipment, as evidenced by the forging press shown in Fig. 11. The operation is that of forging drawbars from a billet. One billet of the size shown makes two safety bars and a drawbar. The principal advantage of this machine lies in the fact that it presses the piece to size, instead of "hammering" it, thus avoiding the noise and vibration of the steam hammer, and producing better and more accurate work. The speed of the ram is under perfect control at all times, and a scale which is attached to the side of the machine eliminates the necessity for using a caliper.

One of the more speedy operations in this department is that of forming collars for the throttle arrange-

(Continued on page 98)

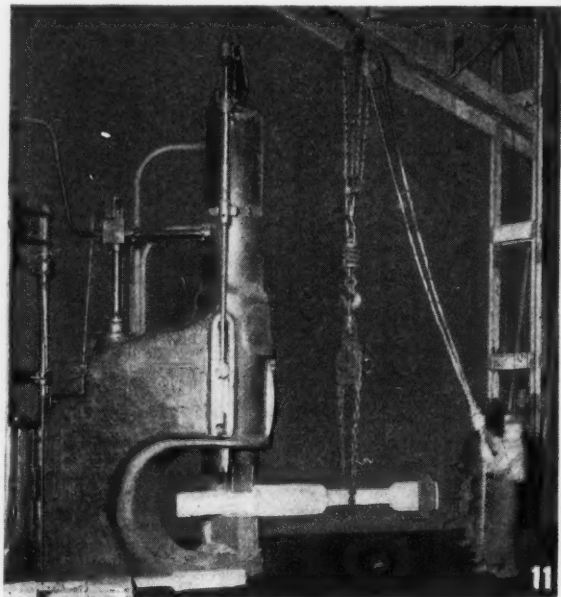


Fig. 11—This modern forging press has many advantages over the steam hammer. Three drawbars are forged from this billet.

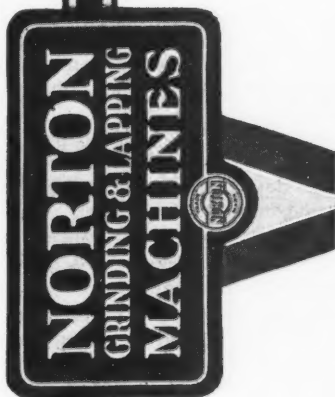
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Plant Layout.

"The Importance and First Principles of Plant Layout"

By HOWARD CAMPBELL

THE proper arrangement of plant equipment constitutes a problem which is fully appreciated only by those managers and shop executives who are best versed in modern methods of manufacturing and who are best able to analyze the various items which make up the cost of plant operation. This item is as important as any other in the manufacturing plan, and upon the manner in which the equipment is arranged depends, to a large extent, the responsibility for loss or profit.

The methods of determining the correct locations for machines have been developed practically to a science, credit for which must be given largely to the automotive industry. These methods are, however, applicable in some degree to practically all manufacturing plants, and the owners of even the smallest shop will find that if an analysis of conditions is made and a paper layout is made before an attempt is made to set the machinery in place, the effort involved will be paid for many times over in increased efficiency of operation.

In arranging the equipment in a small shop, the smaller machines are usually grouped together in one department, with the heavier equipment in another. As extra machines are added, with the growth of the business, an effort is made to group machines of the same type together, resulting, ultimately, in departments being formed of the machines of each kind. In a jobbing or tool shop this

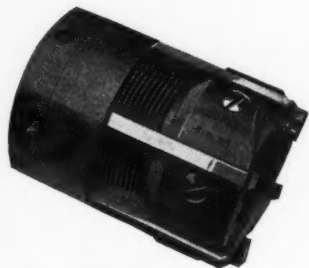
is undoubtedly the best method, but if the shop is concentrating upon the manufacture of a single item, or even a line of products of a special type, the cost of handling the materials back and forth across the shop may run into a large figure—practically all of which could be saved by a readjustment of the machinery.

The first step in making an equipment layout is to decide upon the methods to be used in manufacturing the product. This will, of course, involve a study of the various kinds and types of equipment available for performing the various operations of facing, boring, drilling, slotting and so on—whatever they may be—in order to determine what operations are necessary and to select machines that will deliver the maximum production on these operations, quality considered. Estimates as to the amount of production possible should be solicited from the manufacturers of machines that are built for such work, and, if possible, an attempt should be made to observe the machines in operation.

When all the available information concerning the efficiency of the various machines, prices, costs of operation, costs of tools, jigs, or fixtures required, sizes of machines and amount of floor space necessary has been obtained, an operation layout should be made upon which the operations are listed in order and by number, together with the kind of machine to be used on each operation, and the amount of production expected. This

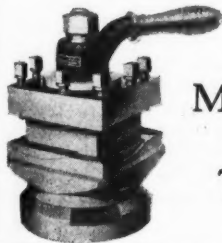


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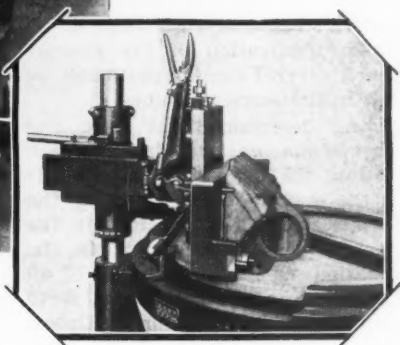
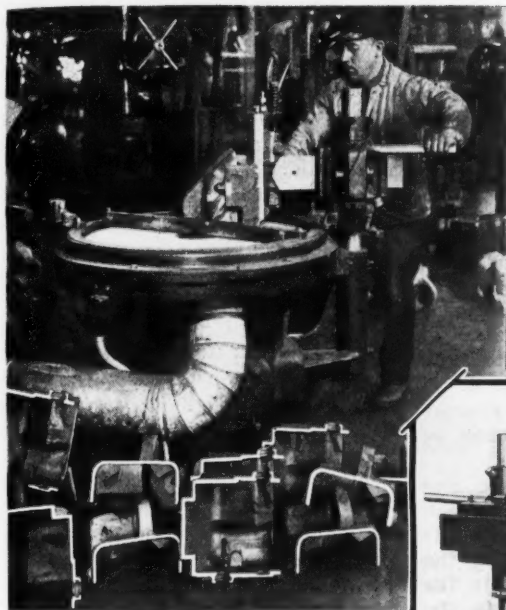
Ludlum Steel Company, manufacturers of Strauss Metal (tungsten carbide) have licensed McCrosky to furnish tools tipped with this metal that has revolutionized production speeds.

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THE old saying — "There's nothing new under the sun" — may possibly apply to fashions, BUT NOT TO GRINDING EQUIPMENT.

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Now, for the FIRST time, it is possible to produce two faces of one casting in an accurate relation with each other, when using a Horizontal Grinder.

The job illustrated is a crank case cover for a 1½ H. P. gasoline engine. The bottom is first ground free-hand on a No. 8C - 30" Gardner Grinder, after which the cover is fixtured as shown, and the side ground SQUARE WITH THE BOTTOM, within .005". The production obtained is 25 pieces per hour, complete in the two operations.

GARDNER MACHINE COMPANY

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will enable the plant manager or production engineer to determine the number of machines needed to obtain the amount of production required. A place for this figure should be allowed on the operation sheet.

Two of the operation sheets used by the Studebaker Corporation are shown in Fig. 1. These two sheets show the operations required in the machining of the front and rear bearing caps, these parts, together with the second, third, and fourth bearing caps, being machined in one department and, in some cases, on the same machines. These layouts serve as an excellent illustration of the manner in which several similar parts can be routed to the same machines.

Having determined the kind and number of machines required for each operation, the next step is to settle upon the manner of transporting the materials from one operation to the next. The important point is the elimination, as far as possible, of all trucking or walking back and forth by the machine operators. Unless the machines on consecutive operations are close enough together so that the work can be easily set down on a table by one operator and as easily picked up by the next, some means should be provided for transporting the materials mechanically, such as a traveling conveyor, roller conveyor, overhead conveyor, or chute.

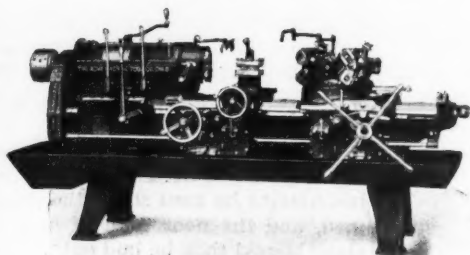
In most cases, comparatively light parts which must be transported a considerable distance, as from the machine department to the assembly floor, can best be handled by an overhead conveyor. The great advantage of the overhead conveyor lies in the fact that it is usually high enough from the floor to clear the aisles and to avoid interference with other operations. Heavy parts, such as motor cylinder blocks, however, are

much too heavy for overhead handling and are usually passed from one operation to the next by means of a roller conveyor. As the piece is placed on the conveyor it is given a slight push and the momentum carries it along until it hits a stop or is stopped by the operator at the next machine. In handling heavy work, the roller conveyor may be arranged to pass close enough to the machine so that one end of the piece can rest on the conveyor while the other end rests on the machine table, thus making it possible for the operator to lift only half the weight of the piece. In some cases the machine may be designed so that the machine table becomes a part of the conveyor line, thus saving both time and labor.

Castings that are too heavy to be lifted, but which must be moved too far to be carried by momentum, are best handled on roller conveyors that are operated by power. Such pieces can also be carried up an incline by such a conveyor, thus making it possible to move the castings up a short incline to a high point where they can tilt onto an inclined roller conveyor upon which they will travel by gravity to a point some distance away. Gravity can be easily used in the case of small parts, such as pistons, the simplest apparatus consisting of a chute with the receiving end up as high as can be reached conveniently by the machine operator, and with the opposite end low enough to afford the necessary gravity. The delivery end should be as close to the operator on the next operation as possible.

An exception to the foregoing must be made in some cases, where the parts are too heavy to be hung on an overhead conveyor, and still must not be allowed to bump against each other on a roller conveyor or chute.

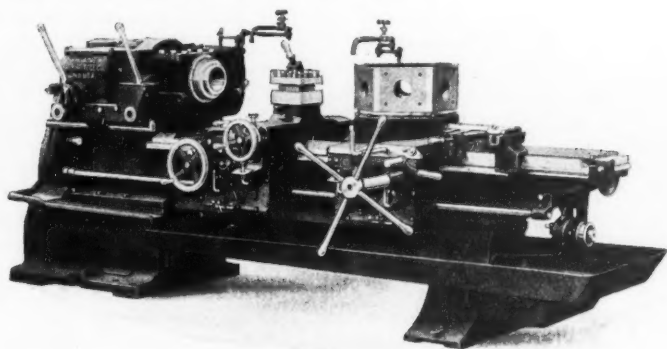
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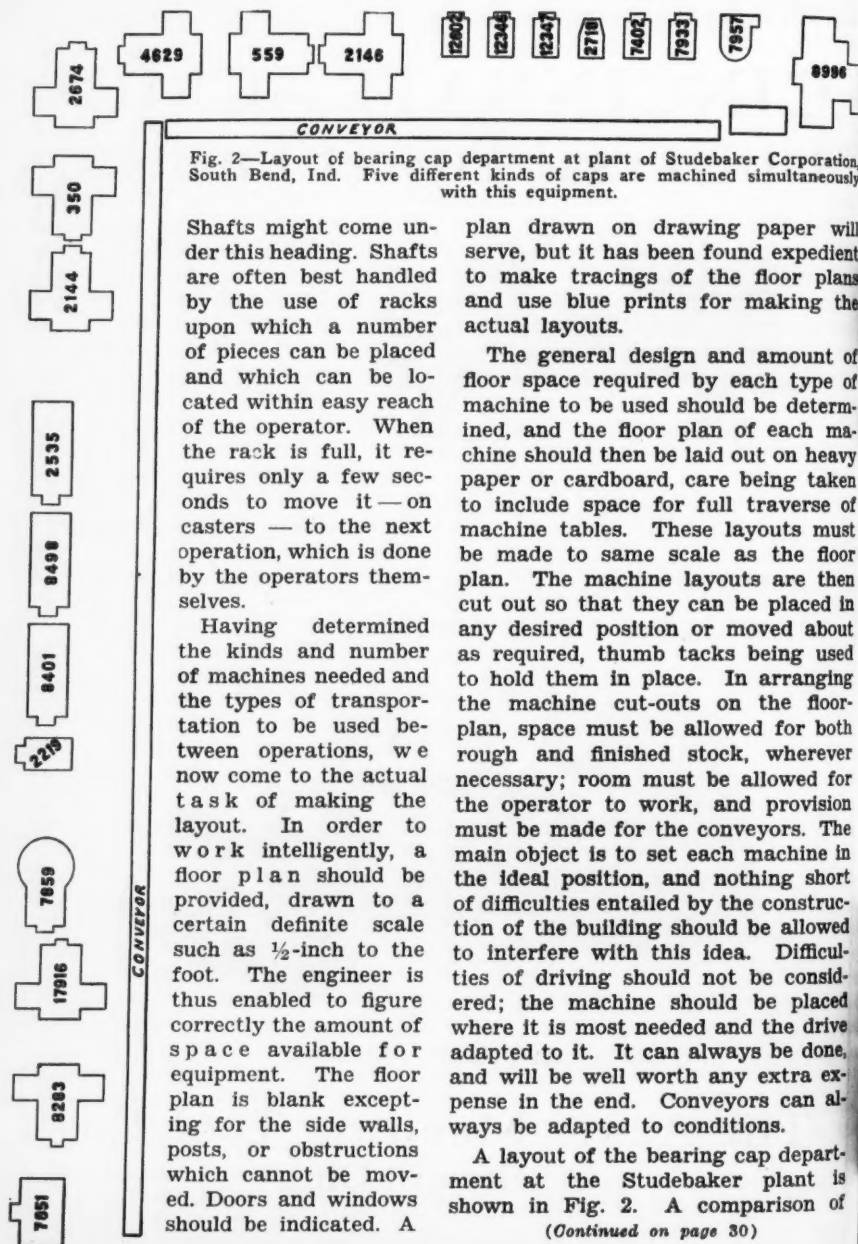


Fig. 2—Layout of bearing cap department at plant of Studebaker Corporation, South Bend, Ind. Five different kinds of caps are machined simultaneously with this equipment.

Shafts might come under this heading. Shafts are often best handled by the use of racks upon which a number of pieces can be placed and which can be located within easy reach of the operator. When the rack is full, it requires only a few seconds to move it—on casters—to the next operation, which is done by the operators themselves.

Having determined the kinds and number of machines needed and the types of transportation to be used between operations, we now come to the actual task of making the layout. In order to work intelligently, a floor plan should be provided, drawn to a certain definite scale such as $\frac{1}{2}$ -inch to the foot. The engineer is thus enabled to figure correctly the amount of space available for equipment. The floor plan is blank excepting for the side walls, posts, or obstructions which cannot be moved. Doors and windows should be indicated. A

plan drawn on drawing paper will serve, but it has been found expedient to make tracings of the floor plans and use blue prints for making the actual layouts.

The general design and amount of floor space required by each type of machine to be used should be determined, and the floor plan of each machine should then be laid out on heavy paper or cardboard, care being taken to include space for full traverse of machine tables. These layouts must be made to same scale as the floor plan. The machine layouts are then cut out so that they can be placed in any desired position or moved about as required, thumb tacks being used to hold them in place. In arranging the machine cut-outs on the floor-plan, space must be allowed for both rough and finished stock, wherever necessary; room must be allowed for the operator to work, and provision must be made for the conveyors. The main object is to set each machine in the ideal position, and nothing short of difficulties entailed by the construction of the building should be allowed to interfere with this idea. Difficulties of driving should not be considered; the machine should be placed where it is most needed and the drive adapted to it. It can always be done, and will be well worth any extra expense in the end. Conveyors can always be adapted to conditions.

A layout of the bearing cap department at the Studebaker plant is shown in Fig. 2. A comparison of

(Continued on page 30)

Large



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Importance of Plant Layout

(Continued from page 26)

the operation sheets (Fig. 1) with this layout will show that, while the first operations are performed on different machines, the Natco multiple drilling machine, No. 7859; the Barnes drill, No. 2219; the LeBlond milling machine, No. 350, and the Pratt & Whitney grinder, No. 8996, are used in the machining of both caps. As a matter of fact, they are also used in the machining of all the other caps, for which the operation sheets are not shown. The Natco has a revolving table upon which jigs for all caps are located, a complete set of caps being drilled with each revolution of the table.

The first operation on the rear bearing cap is performed in the Cincinnati duplex miller, No. 7851; the front bearing cap is first milled in the Becker vertical miller, No. 17916; the third bearing cap is milled in the same machine, and the second and fourth bearing caps are milled in the Becker vertical miller, No. 8283. The rear bearing cap is rough bored in the screw machine, No. 8401; the front cap is rough bored in No. 2535—which is also used to rough bore the third cap—and the second and fourth caps are rough bored in No. 8498. All caps except the rear cap then go to the LeBlond miller, No. 350, to be straddle milled; the rear cap stops first at No. 2144 to have the ends milled. The stock is moved in boxes, which are placed on a roller conveyor and moved from one operation to the next by momentum received from a slight shove.

Machines that are to perform the same operations may be arranged on opposite sides of the conveyor line so as to keep the operations in the proper sequence, if they are to be run by different operators; if several machines are to be run by the same op-

erator, they should be arranged so that a minimum of walking about is necessary. For example, if one operator is to operate three multiple drilling machines, the machines should be set to form three sides of a square with the operator's position in the center, the conveyor forming the fourth side. Fig. 2 shows three instances of two milling machines set facing each other so that one operator can run both machines.

Overhead conveyors can be indicated on the layout by ordinary white twine, fastened in place with tacks. The conveyor layouts are put on after the cut-outs for the machines have been fastened in place. Conveyors that require floor space, such as roller conveyors, power conveyors and chutes, are indicated on the layout by strips of paper, cut to scale. It is good practice to indicate conveyor layouts with colored paper or cardboard to avoid confusion with production equipment.

In making a layout, every piece of equipment that requires floor space should be indicated by a cut-out, drawn to scale, including stock racks, tables for the machinists' tools, emery wheel stands, benches, and so on. If the cut-outs have been correctly made and placed, the plant manager or superintendent will know exactly where each machine is to be set and just what the condition of his shop is to be before a machine is moved. He can try out any arrangement or combination he wishes by simply moving the cut-outs—and it is much easier to move a cardboard cut-out than it is to move a 1,000-pound machine. In addition, the layout will provide him with a miniature bird's-eye view of his shop and will enable him to study his production problems much easier than he can possibly study them while walking around among the machines.

**KOKOMO
HI-SPEED**

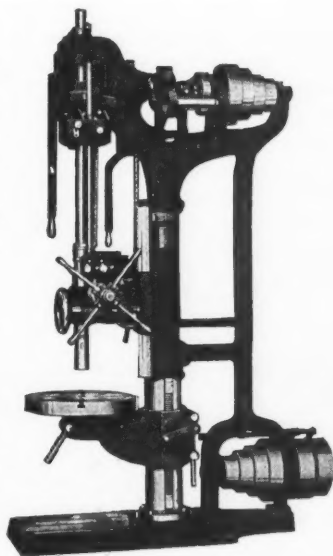
and ~ that's NECESSARY

WHEN your requirements demand Hi-Speed production, you can't "puddle" around with worn out drilling equipment.

Take a look at the 25-inch KOKOMO HI-SPEED Drilling and Tapping Machine, and notice that it is equipped throughout with high grade bronze bushed bearings, which assures you of that necessary continuous operating.

That's what counts in HI-SPEED production.

When you visit the National Machine Tool Show in Cleveland, Sept. 30 to Oct. 4, stop with us at Booth 3-W-18; we'll show you the machine and explain how much *difference* it will make in YOUR production.



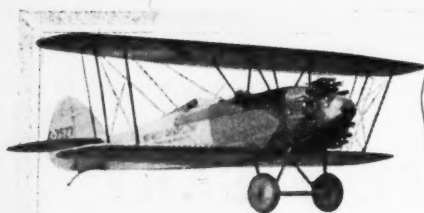
25" KOKOMO HI-SPEED
Code: Bush-Tap

Superior Machine Tool Co.

P. O. Box 376

KOKOMO, IND.

SINCE
1902



ONE of the largest of the plants upon which the fast-growing airplane industry is based is the plant of the Waco Aircraft Company, Troy, Ohio, manufacturers of "Waco" airplanes. Founded less than eight years ago, this plant is now producing from 100 to 150 planes per month, with the production schedule steadily increasing.

The "Waco" fuselage is constructed entirely of steel tubing, assembled in jigs of structural steel, and welded into a rigid structural unit. The work of assembling and welding each of the sections that form the fuselage, as well as the wing sections, motor mountings, and other parts, is divided

"Building "Waco" Airplanes By Modern Methods"

By PHILIP WINTER

so that it can be handled on a production basis. This method not only tends to promote better quality, but also keeps the work flowing through the shop at an even speed, due to the fact that each operator becomes expert by confining his efforts to one class of work.

The first operation in the construction of the fuselage is that of cutting the various sizes of steel tubing to length, which is done in the band saw shown in Fig. 1. Fixtures are used to hold the tubing at the correct angle, as shown. Steel tubing of 1025

(Continued on page 36)

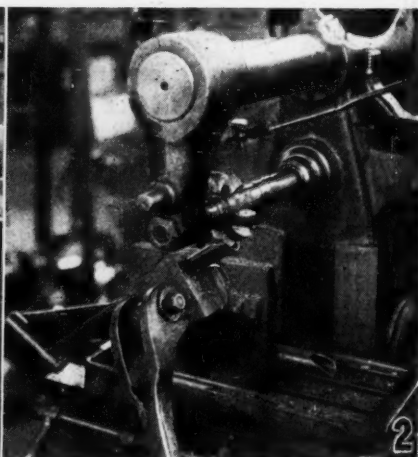
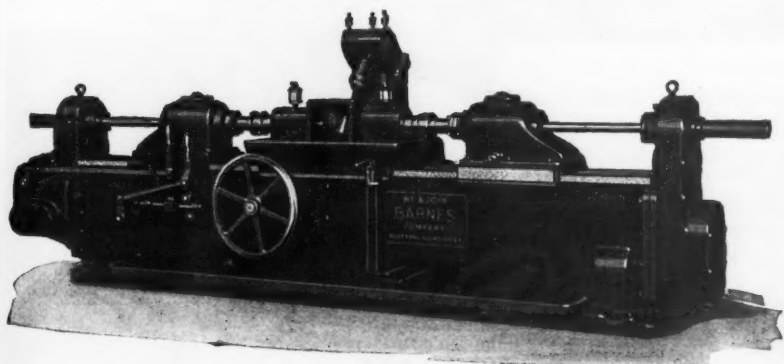


Fig. 1—Sawing sections of steel tubing to length. Fig. 2—Close-fitting joints are assured by milling the ends of the tubing at an angle.

BARNES

HORIZONTAL DUPLEX and SINGLE HEAD

PRODUCTION BORING and DRILLING MACHINES



**BARNES No. 420 Horizontal Duplex Differential Carrier
Boring and Tapping Machine**

*May we have your inquiries for
Production Boring Equipment?*

W. F. and JOHN BARNES CO.
ROCKFORD, ILLINOIS

Upright Drills Screw Presses
Horizontal and Vertical Production Drilling and Boring Machines

(Continued from page 32)

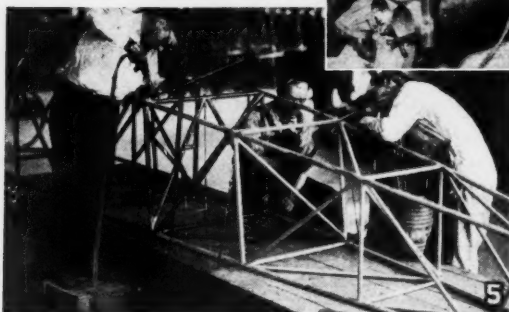
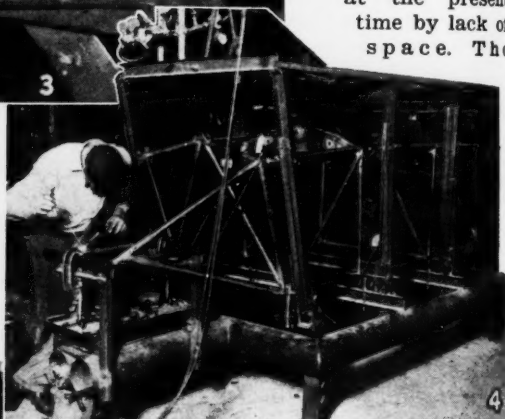
S. A. E. specifications is used for parts upon which no stress is to be placed, chrome molybdenum steel being used where strain occurs. The

this operation the milling machine shown in Fig. 2 is used, with a fixture to hold the piece at the correct angle while the slot is milled.

The fuselage is constructed in three units, each of which is assembled and welded in a separate jig. Upwards of 65 welding torches are in operation simultaneously, the number being limited at the present time by lack of space. The



Fig. 3—The side section is assembled and welded in this table jig. Fig. 4—The fuselage is built in three sections, each of which is assembled and welded in a box-jig to insure accuracy and alignment. Fig. 5—Assembling and welding the fuselage sections together.



oxygen gas cylinders are hooked up in units of 20, and both the oxygen and acetylene gases are carried to the welders through overhead pipes. A carload of oxygen is used per week in this plant.

The sides of the fuselage are first welded in a flat jig, as shown in Fig. 3, then the sides are assembled to the unit in a box-type jig similar to that shown in Fig. 4. Each of these jigs is so constructed that the sections of tubing can be clamped in the exact position they

operator is shown sawing steel tubing into sections for rudder bar braces.

Sections of tubing that are assembled to other sections at an angle are milled at one end so that the two pieces will fit together properly. For

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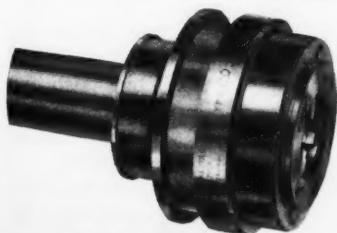
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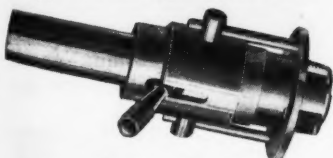
THREE

MURCHEY WINNERS

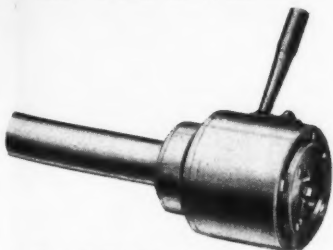
Solving Production Problems Everywhere!



Type C-O Self-Opening Die Head



Lever Handle Collapsible Tap



Type G Self-Opening Die Head

1. *Murchey Type "C-O" Self-Opening Die Head* is used particularly on automatic screw machines. The collar trip opens the head instantly at any predetermined point.

2. *Murchey Lever Handle Collapsible Tap* automatically collapses when the trip ring strikes the face of the work. There is a model for both stationary and revolving spindles.

3. *Murchey Type "G" Self-Opening Die Head* is ideally suited to non-rotating single spindle automatic threading machines as it is instantaneous in action, small in diameter and a precision tool in every respect.

Murchey tools are made in forty-six sizes of collapsible taps and fifty-five sizes of self-opening dies from which to solve your threading problems:

Write for Catalog!

MURCHEY MACHINE & TOOL COMPANY

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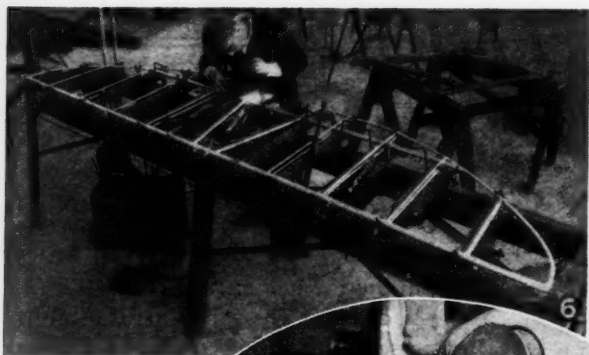
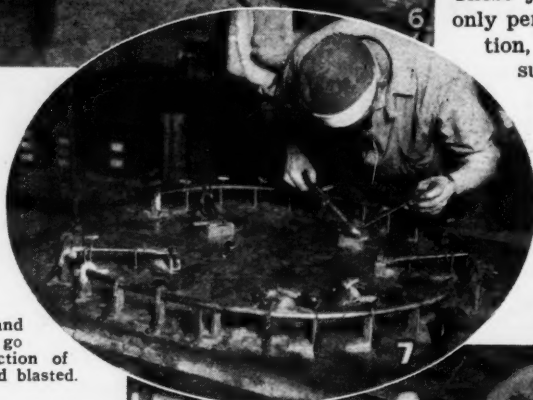


Fig. 6—Building a frame for a stabilizer. This unit is also assembled and welded in a jig.

Fig. 7—Welding the supports to the motor mounting.

Fig. 8—The sand blast room. All steel and iron parts that go into the construction of the plane are sand blasted.



are intended to occupy, without variation. The pipes through which the acetylene and oxygen are conveyed to the welder are located just over the jig, with the regulating valves within easy reach, and an ample supply of welding rod is stored against each upright section of the jig.

As each fuselage section is completed, it is removed from the jig and combined with two other sections to form a complete fuselage, as shown in Fig. 5. At the same time all the other joints are inspected and any additional welding that may be required is done.

The mechanic shown in Fig. 6 is constructing a stabilizer, which is also built over a framework of steel tubing. This illustration shows the jig with the sections of tubing clamped in position. These jigs insure not only perfect construction, but also insure the interchangeability of parts.

A motor mounting is constructed by bending a section of tubing to a circle of the



desired diameter, then clamping it in a jig as shown in Fig. 7 and welding the supports to it in the necessary locations. The position of the supports is determined by the jig. The inner end of each support has been flattened and drilled and a boss is

NEW

-different-a departure

Everything

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in a Grinder

- Oversize 40° Motor.
- Push Button Control.
- Automatic Motor Starter.
- Overload Protection.
- Oversize Chrome-Manganese Spindle.
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Hill - Curtis Engineers specializing in Grinding and Polishing Machinery have developed these new machines. The many practical improvements not only increase production through their adaptability, they offer maximum protection to operator and machine. Study and compare these machines—we are sure your selection will be a Hill-Curtis.

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NATIONAL MACHINE TOOL
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BOOTH 2-W-8

GRINDERS & POLISHERS

Sizes 6" to 24" wheels.

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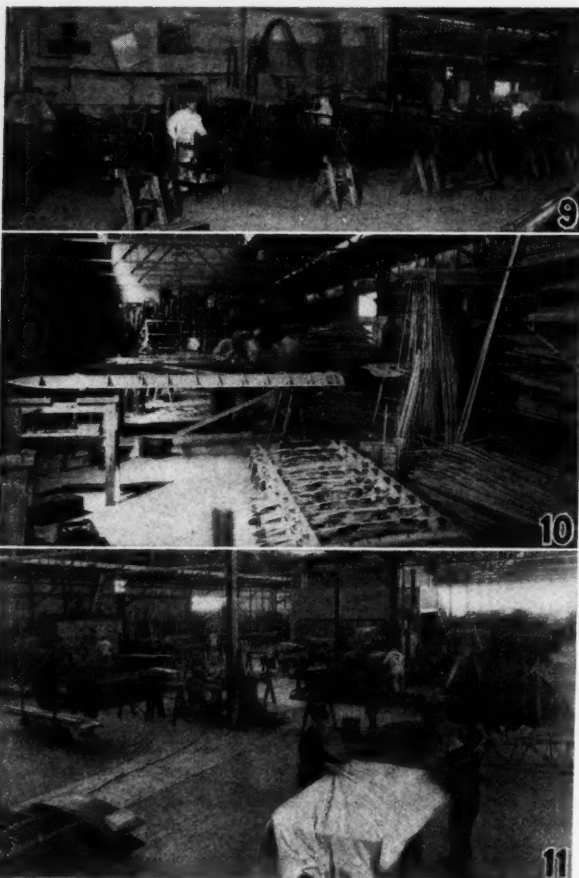


Fig. 9—The fuselage assembly department. The fuselage is moved from one station to the next as each operation is completed. Fig. 10—The wing department. Airplane spruce and mahogany plywood is used in the "Waco" plane. Fig. 11—Covering a wing skeleton with fabric.

welded into it to form a solid anchorage for the engine bolts.

All steel and iron parts that go into the construction of the plane are sand blasted, including the completed fuselage. The equipment with which this operation is performed is shown in Fig. 8, where the operators can be seen sand blasting some of the metal struts and other metal parts. The

sand blast operation removes all dirt, grease, or oil, and prepares the metal for plating or lacquering. All metal parts that are exposed to the weather are plated with cadmium, including bolts, nuts and cotter pins. All false ribs or leading edges are made of duralumin, and the trailing edges are copper-plated steel.

One side of the assembly floor is shown in Fig. 9. Here the controls are put on, seats are put in, bottoms and sides assembled to the body, and the gas tank, floor boards, and fire wall are added. The fuselage starts at one end of the line and is moved from one station to the next as each operation is completed.

The wings are of the single-bay type, using two wing struts and one aileron strut. Airplane spruce is used for the spars and cross members, with wing walks of mahogany plywood. The floorboard is also of mahogany plywood, to give the necessary strength. Each wing contains 350 pieces of plywood and approximately 3,500 brads. All wood parts are sanded by a motor-driven belt sander before using. A part of

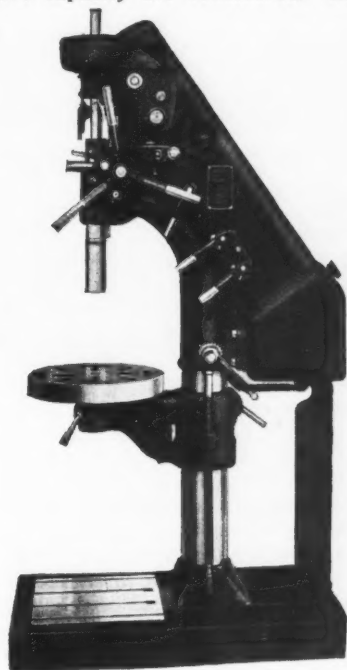
Every Modern Machine Shop Needs This Self-Oiling, All-Geared Drilling Machine

FOR driving drills and taps, up to 1¼-inch diameter, to their full capacity in any metal, the 20-inch Self-Oiling, All-Geared Drill is unexcelled. Some of its many features and advantages are listed below. Based upon sound engineering, built of the best materials, with the finest workmanship; its price is surprisingly low when its high quality and profitable productive capacity are considered. Installation cost is low, also—it has no inherent belts and is delivered complete, ready to run.

FEATURES OF THE 20-INCH SELF-OILING ALL-GEARED DRILL

Especially heavy construction
Right angle drive
Very rigid and powerful
Instant change of feeds and speeds
Chrome nickel steel transmission
Eight geared speeds
Self-oiling bearings
Eight geared feeds
Coil spring spindle-return
No cone or inherent belts
Operates easily
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*Visit our exhibit
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Sept. 30 to Oct. 4.
Space 2-D-4.*



20-inch Self-Oiling, All-Geared Drill

BARNES DRILL COMPANY

801-851 CHESTNUT STREET

ROCKFORD, ILLINOIS

the wing department is shown in Fig. 10, and another section of the department is shown in Fig. 11, where the

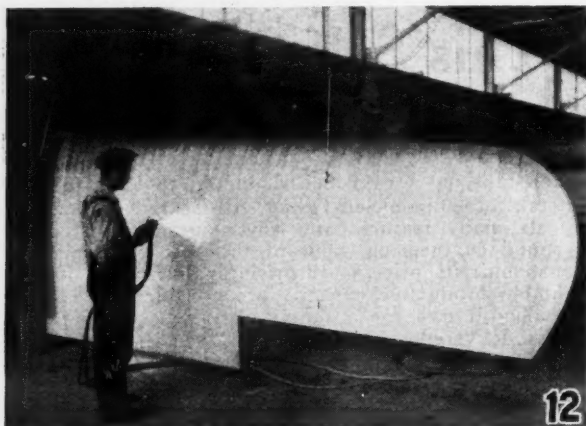


Fig. 12—Spray-painting a wing with aluminum. The aluminum serves as a base for the color coat.

mechanics can be seen covering a wing skeleton with fabric. The fabric, which is made of a special grade of long staple Egyptian cotton, is then

covered with three coats of "dope" and sanded, after which it is lacquered. This same treatment is applied to the fuselage and tail surfaces. The dope draws the fabric taut, reinforces it, and makes it impervious to moisture.

The operation of spray-painting the wing is shown in Fig. 12. The first two coats are aluminum paint; after these coats have been applied, two coats of the desired color are put on. As each wing section is brought in from the assembly floor, it is hung on a wire which serves as a conveyor and is moved into one of the spray booths. After painting, the wing is sent to the final assembly, to become a part of a "Waco" plane.

Keep Records of Machine Repairs

IF the machine repair foreman will keep a record—preferably in the form of a 4x6-inch card index—of the repairs made to each and every machine in the shop, he will find that the information thus disclosed will be sufficiently valuable to more than repay him for his trouble. The recorded data should include the manufacturer's name, kind and size of machine, equipment number, source of supply, date of installation, and department in which it is installed. The card should be ruled on the reverse side, with spaces for the date and nature of repairs made, and cause of failure.

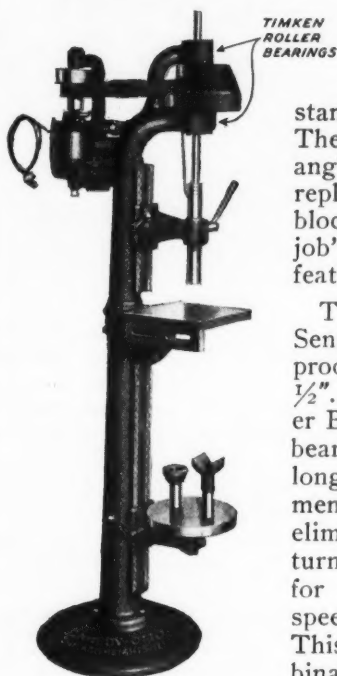
Whenever a repair is made on a machine, the proper notation should be made on the card. Periodic exam-

inations of the cards will disclose a great deal of useful information as to the machines that are giving more than a normal amount of trouble, with the causes. If the record shows that the same break-down has occurred on a machine several times, steps can be taken to prevent a recurrence. The break-down may be the fault of a weak or poorly-designed part in the construction of the machine, a worn or unsuitable accessory unit (such as the pump or clutch), a bad driving arrangement, over-estimating the capacity of the machine, faulty material, or inefficient operator—any of which causes should be permanently remedied if the same failure occurs more than twice.

CANEDY-OTTO

14" Sliding Head Sensitive

FLOOR DRILL



**CATALOG UPON
REQUEST**

AS TYPICAL of the convenience offered in C-O Drills note the two tables included as standard equipment of this floor drill. The square table may be tilted to any angle or swung around the column and replaced by the round, cupped, or V block table supplied. "Ready for the job" delivery is the first cost-reducing feature of these drills.

The Canedy-Otto 14" Sliding Head Sensitive Floor Drill is a fast, accurate production machine for holes from 0 to $\frac{1}{2}$ ". Cone pulley runs in Timken Roller Bearings, spindle runs in ball thrust bearing, supported by sleeve with extra long bearing. Vertical motor attachment simplifies power transmission, eliminates idlers, pulleys, twist and turn belt, etc., reducing power required for efficient operation. The spindle speeds are 400, 850, and 1,750 R. P. M. This drill can also be furnished in combination speeds as follows: 525, 1,400, 3,000 R. P. M.; 1,000, 2,200, 5,000 R. P. M.; 3,400, 5,600, 10,000 R. P. M.

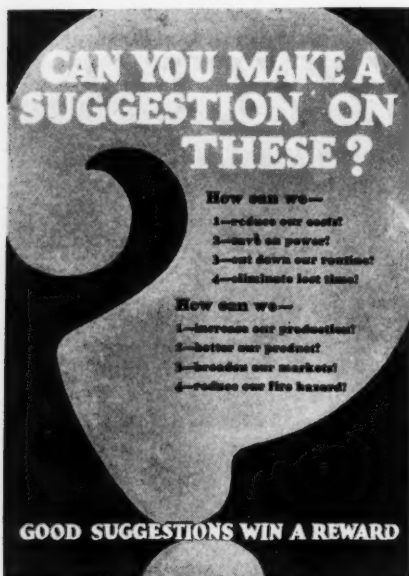
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Getting Results With a Suggestion System

By RUSSELL BYRON WILLIAMS

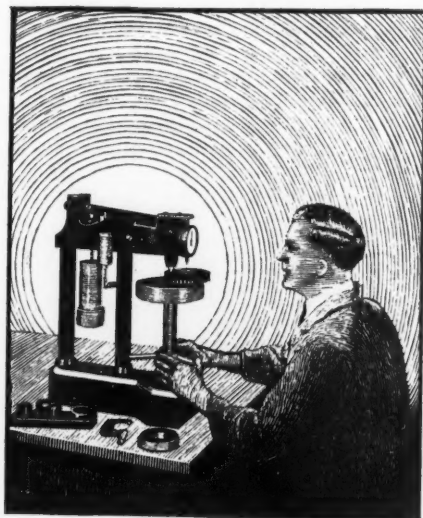
THE creation of the desire to produce more, to waste less, and to employ greater safety is the one unending task of every management. Industrial relations engineers are of one mind that compensation alone is not sufficient in itself to create that desire. Without inherent, natural interest in the work to be done or the problem to be solved, all effort to stimulate desire on the part of the employee will be of little avail. But convince such an employee that his ideas will be recognized and rewarded according to their worth, and his interest in all phases of activity will be quickened and his desire to work, save, and remain on the job will be stimulated.

Once the interest of the worker has been aroused, he immediately feels himself a definite, integral part of his organization—not merely a name or number. Through his suggestions, born of increased interest

in his work, he makes himself heard and proves to himself that the management is not the cold-blooded, distant autocrat he might have thought, but rather is composed of considerate men who are fully aware of his existence and daily effort. As the feeling develops that he is not "lost" or "sidetracked," but is a recognized part of his company, his loyalty to

Much of the material given in this and succeeding articles is taken from the author's book on Suggestion Systems, copyrighted by Morton. All posters reproduced here are also copyrighted by Morton.

both management and organization increases correspondingly. And the greater his loyalty, the less likely will he be to leave his job to search for greener fields. It is possible, therefore, for a well-handled suggestion system to perform a large task in increasing the stability of the working force—and the cost of labor turn-



THE Rockwell Tester we have is a great help to us in maintaining hardness within a specified limit, and we do not know of any other machine that would be as satisfactory for certain classes of work as the Rockwell Hardness Tester. It takes in large and small sections, and the work of testing can be done without sacrificing accuracy.

The National Lock Washer Co.

R. F. Golden,
Gen'l Factory Manager

4,000 ROCKWELL Hardness Testers

are now in use.

Here are two small examples of the

Big Reason Why

WILSON-MAEULEN CO

INCORPORATED

Concord Avenue and 143rd Street

NEW YORK

THE Rockwell Hardness Tester, which we have, is giving complete satisfaction. It serves as a standard in gaging the hardness of Bath Ground Thread Products. The fact that the tester will operate successfully in such a variety of shapes and sizes of product is a strong point in its favor.

John Bath & Co., Inc.
R. E. Lamb

PLEASE READ CAREFULLY

This suggestion box was put here for mutual profit. You will get as much out of it as the management because we will reward every suggestion that is accepted.

Send us your ideas or suggestions on anything you think will benefit the company.

Make your suggestions on the regular suggestion blanks and submit them through the Suggestion Box.

Collections will be made weekly and acknowledgment of your suggestions will be sent you as promptly as possible after collection.

Upon collection your ideas will be recorded and given a number. They will be carefully guarded and held in strict confidence.

All accepted suggestions will be paid for in accordance with our schedule of awards.

Each week, and at the time collections are made, a new poster will be inserted which will call for suggestions on specific subjects. It isn't necessary, of course, to confine your suggestions to the idea given on the posters. Make suggestions on any subject that occurs to you. The posters are inserted weekly merely to give you ideas for suggestions.

You have many good ideas about things that could be done, or done differently, that would save or make the company money. Turn your ideas to profit by putting them into the form of a suggestion.



ARE WE WASTING POWER?

Slipping belts, dripping faucets, worn gears, binding rollers, all waste mechanical power.

Bruised fingers, machinery breakdowns, accidents, all waste human power.

Are we wasting power—either human or mechanical?

Look about you and see our plant facilities and materials as a stranger would see them if he walked into the plant for the first time. Note our various processes and methods as if you had never before seen them. Then tell us where improvements could be made or power could be saved.

Your suggestion will be acknowledged personally and liberally rewarded if found practicable.

By helping us save you help yourself earn

over is a much higher item of expense than is generally supposed.

As interest increases and loyalty develops, it is but natural for the individual to consider intolerable any visible waste of material, time, or effort. Develop the loyalty of the worker and let him know that his value as a part of the organization is recognized and you will have gone far toward the goal of waste elimination. Particularly is this true when a suggestion system is used which openly rewards ideas on waste reduction or reclamation—when financial gain is the incentive for such effort.

Perhaps one of the greatest benefits to be derived from the use of a suggestion system is the reduction in accident hazards which is usually effected. Industrial accidents are, as every employer well knows, exceedingly costly not only to the men involved, but also to the management. Indeed, the incidental costs attendant

upon industrial accidents are frequently three or four times the bare cost of compensation. The reduction of accidents is therefore a financial as well as moral obligation devolving upon the management. No better way to attain such reduction has ever been devised than the suggestion system; such a system gathers in the ideas of those who are best fitted to make them—the men on the job.

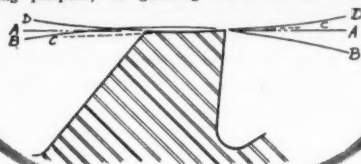
Posters and placards, placed conspicuously, most certainly do a great deal of good in that they serve to caution, constantly, the employees against the danger and folly of "taking a chance." The suggestion system, however, enables the employee to find his voice and—with first-hand knowledge of the kinds, types, and locations of the dangers to be encountered—warn the management and aid in developing ways and means of eliminating these dangers.

Concretely, a few of the results to

Coarse tooth spiral mill set-up with under-slung tooth rest. Tooth rest is carried on stationary wheel head. Wheel pressure keeps tooth against blade.



DD represents periphery of grinding wheel, BB circumference of cutter, AA desired clearance as obtained with cup wheel on Ohio Grinder, CC clearance angle obtained using periphery of grinding wheel for clearance.



More Cutting —Less Grinding

With Solid-Backed Cutting Edge

ON THE Oesterlein Grinder, a cup-shaped wheel grinds a straight-line clearance that results in a solid-backed cutting edge. This type of edge lasts much longer than any hollow ground one.

The advantages of a solid-backed cutting edge? It stands up longer and results in less time out for maintenance, increased output,

reduced cost of production. These savings characterize the Oesterlein Grinder and soon pay for the machine.

The sketch above shows the right and wrong way of grinding cutters. The photograph indicates correct set-up on an Oesterlein Grinder for grinding coarse tooth spiral mills in a way that means more cutting and less grinding.

Write for booklet E—a treatise on correct grinding of metal-cutting tools.

THE OESTERLEIN MACHINE CO., Cincinnati, Ohio

OESTERLEIN
OHIO
MILLING
GRINDING DRILLING
EQUIPMENT

be gained through the inauguration and proper maintenance of a suggestion system may be listed as follows:



IN THE old days, when they walked in an apartment along the highway, they measured the distance by means of a stick drawn straight by the middle of the stick. If the horse failed to travel in the center of the road, if the wheel wobbled, or if the owner lost steps, the trouble of error would be immense. We could hardly consider such methods today.

Accuracy — our prime essential

Upon installation in a great electric generating plant, an enormous dynamo refused to operate. To make good on the job, the manufacturer had to install a second dynamo—at a loss of over \$28,000. The trouble was traced to a pair of inaccurate calipers which had cost \$4.75.

Mistakes are costly. To make money we must be accurate.

Do you know of any place where inaccuracies are now being made? Have you noticed imperfections or inaccuracies slipping by unseen? If so, by all means tell us, and suggest a remedy. Do it through this suggestion box.

Help us to be accurate

- 1—It enlists the interest of the workers.
- 2—Creates the desire to produce more, waste less, and exercise greater safety.
- 3—Develops loyalty to employer and organization.
- 4—Improves relations between management and men.
- 5—Reduces labor turnover.
- 6—Improves quality of both workmanship and product.
- 7—Reduces accident and fire hazards.
- 8—Effects reduction in operating expenses.
- 9—Reveals capabilities justifying recognition and promotion.

Comment might be made on point nine by saying that the encourage-

ment of an employee to think in terms of management—which he must do to make a suggestion—is in itself excellent training for a position of higher responsibility. Any firm whose policy it is to fill vacancies in higher positions from the ranks will find a properly-installed suggestion system not only a stimulus and training medium, but also a guide to eligibility for advancement. Indeed, what reward could be more appreciated than a promotion. As B. C. Forbes has put it: "A \$100 or \$500 prize might be ever so cordially welcomed, but its value is little in comparison with promotion to a job that pays more money and carries increased responsibility." Evidence of the truth of this statement is found in scores of organizations, such as the National Cash Register Company, the Eastman Kodak Company, or the H. H. Franklin Manufacturing Company, where scores of men have been promoted because of eligibility which was revealed through suggestions made by them.

A Few Results

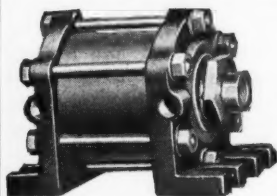
There is abundant evidence that properly-operated suggestion systems are, in many cases, proving valuable means for saving money and for winning recognition by capable employees. At the Mead Pulp and Paper Company, the reduction in the accident record alone has more than

{ The posters reproduced in this article are four of a set of fifty-two, each of which was designed to stimulate suggestions along certain lines. Other suggestion-producing posters will be reproduced in subsequent articles. }

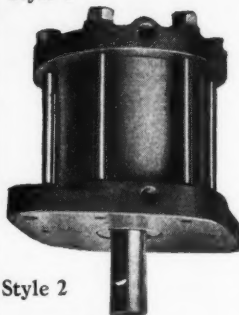
justified the installation and maintenance of its suggestion system, to say nothing of the improvements that have been made in methods, reduction in operating expenses, and so on.

Executives of Bird and Son's (paper manufacturers) credit their sugges-

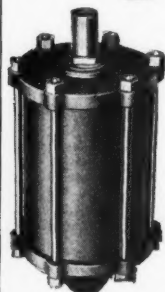
"BUILT FIRST—TO LAST!"



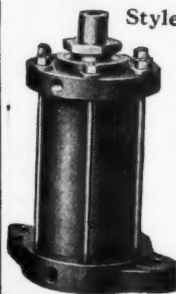
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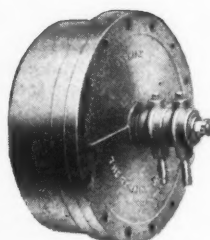
Style 2



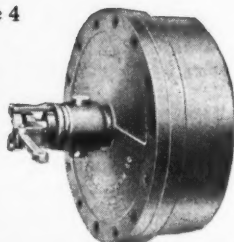
Style 3



Style 4



Series B



Series C

“HOPKINS” Pneumatic CYLINDERS
Give Utmost Service and
Protect Production Profits!

THERE are thousands of machine controls operated by hand—operations that waste time, consume energy and cannot be safeguarded.

“HOPKINS” Pneumatic CYLINDERS and complete control equipment will solve your production problems. They will prove to you a better way than that of your present hand-operation methods.

Mail Coupon below for further data and prices.

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tion system with greater co-operation between management and men, increased safety, and better working conditions. Toy Tinkers, Inc. (who



OVER THE BACK FENCE

ARE WE WASTING TIME?

Time is the most valuable of all things. If we could hoard time like we save money we would be rich in a month.

When made full use of, time enriches us. When wasted, it destroys us.

Minutes that are lost in unnecessary operations, in needless delays, in tardiness, or in any other way, subtract heavily from our profits and wages.

Do you know any operation, process, or place where we can save time? If you suggest a way to save time that we can adopt readily, you will be liberally rewarded.

Lost minutes are never regained

limit the function of their suggestion system to invention or improvements in the product) have developed three highly profitable toys from employee suggestions and have found that their system of rewards taps an almost limitless field for ideas that may be capitalized to the advantage of both the corporation and the individual. According to officials of the Lincoln Electric Company, the conduit box now used by this company—which they consider superior to all other types—was evolved through a combination of the best features contained in several suggestions received from their workmen.

The suggestion boxes installed in the plant of the National Cash Register Company, nearly a generation ago, have served as the point of con-

tact for the development of many of the improvements and refinements that have been made in cash registers during the past several years, while the layout of a whole packing platform at the plant of Lee & Cady (wholesale grocers) was changed through the suggestion of a young man in the shipping department—and with large economy as the result. The Alamo Iron Works is now using an improved tool holder, with a much better type of tool, and producing better work at less expense, as the result of a suggestion made through the shop suggestion system.

Such concrete results might be

How can we save on material?



Next to labor, raw material is the principal cost of manufacture . . . Saving material means much to all

What are your ideas on this subject?

Very often a worker is able to point out how to save in material. No matter how small, if you have an idea for saving material, please report it through the Suggestion Box. For even a saving of 1¢ per day means over \$300 per year. And more in proportion.

KNOCK OUT WASTE



listed almost without end, but these few will serve to indicate the reason why 37½ per cent of all industrial plants in the United States are either operating or installing suggestion systems in one form or another.

(The second article on this subject will be published in the October issue of Modern Machine Shop)

... Machine Tenders That Guarantee Top-Production from Men and Machines!



218 D. C.—Machine Tender



31-36—Tapered Machine Tender

No. 218 C
218-C—Machine Tender Truck

MORE and better work in less space can be secured by the systematic use of **ANGLE STEEL Machine Tenders**. All-steel, they are extremely durable and will give a lifetime of trouble-free service wherever used.

Catalog "C-M.S." illustrates and describes over 250 ANGLE STEEL Equipment items. Send for your copy. Use the Coupon below.

No. 218 D. C.—The maximum in durability and convenience. Lock-equipped drawer. Four swivel casters. Hand-riveted joints. Size: 24" long x 18" wide x 35" high.

No. 31-36—Legs tapered to insure extra stability. Size: 31½" wide x 18" deep x 36" high. No casters.

No. 218-C—Without drawer. All three shelves have turned-down fronts. Dimensions same as 218 D. C. above.

No. 216—A practical, all-purpose unit. Size: 36" high x 20" wide x 20" deep. Lock-equipped drawer.



216—Machine Tender and Tool Stand

SPECIAL WORK—Let us plan, design and quote you on special angle steel equipment. No obligation.

All tenders finished in olive-green lacquer. May be furnished with or without drawer, lock or casters.

Angle Steel Stool Co.

PLAINWELL, MICH., U. S. A.

Agents and Dealers
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**Mail
Coupon!**

COUPON—Check, attach to firm letterhead, then mail:
☐ Send an experienced shop equipment engineer.
☐ Send New Catalog "C-M.S." of Angle Steel Equipment.
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New Developments In Centerless Grinding

By DONALD A. CLARK

ALTHOUGH the centerless grinding machine has now been in existence a number of years, there is still a considerable lack of appreciation as to the capabilities of the centerless method of grinding. One can readily understand how work is ground accurately on a center type grinder, but the centerless grinder is built without centers and apparently no method of controlling the roundness or accuracy of the work exists, therefore this machine is given scant consideration in many cases where large savings could be made by its use.

The principal elements of the centerless grinding machine are the grinding wheel, regulating wheel and work rest. The work rest provides

a means for supporting the work prior to the grinding operation, during the grinding operation and after the grinding has been completed. The action of the grinding wheel exerts a force on the work toward the work rest, rotating the work and urging it against the grinding wheel. The relative positions of the wheels and work rest determine the accuracy of the operation, as well as the finish of the piece.

The kind of work first ground on the centerless machine consisted only of straight pieces such as piston pins, studs, rollers, and so on, but the machine was rapidly developed to a point where shouldered work could be ground accurately and economically. An idea of the versatility of the ma-

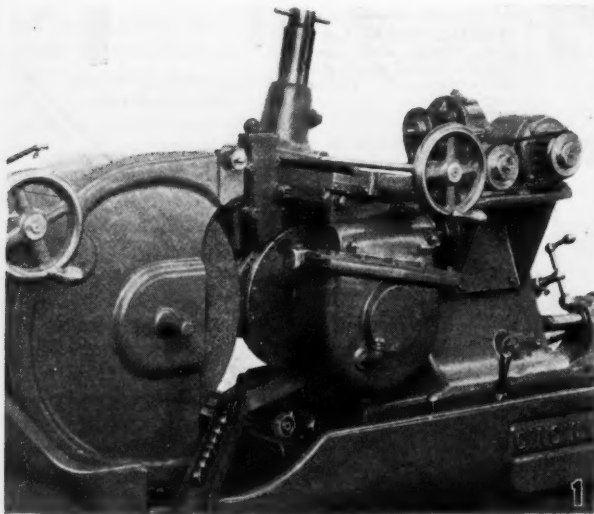


Fig. 1—Grinding 3,200 castor rollers per hour in a Centerless grinding machine equipped with a cage fixture and both receiving and discharging chutes. The only duty of the operator is the loading of the chute. Fig. 2—View and dimensions of the roller.

the passengers from taking photographs of fortified areas.

who a little more than a year ago when he bought the West Coast Theaters, Inc., chain of 200 theaters,

BRADFORD TO EXHIBIT

At National Machine Tool Builders Show

CLEVELAND
SEPT. 30 - OCT. 4

Occupy Booth 2-A-4

The Bradford Machine Tool Company, 659 Evans Street, Cincinnati, O., are planning a very interesting display at the National Machine Tool Builders Show to be held in Cleveland, September 30th-October 4th, inclusive.

The feature of this exhibit will be a demonstration of the

thirty-five exclusive BRADFORD Lathe features which should be considered before purchasing a lathe, and which are all obtained in the BRADFORD latest improved "All Geared" Lathe.

BRADFORD will also demonstrate one of their drilling machines. BRADFORD drilling machines are made up of BRADFORD drill heads arranged in any combination to suit your work. These production units will give satisfactory results wherever a high production schedule must be maintained.

The Demonstrations Are Held Together in One

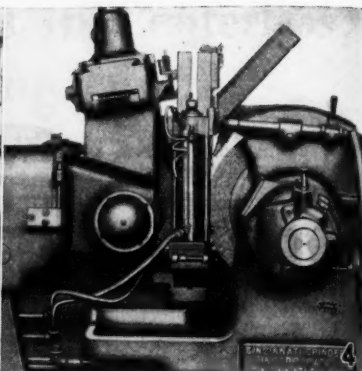
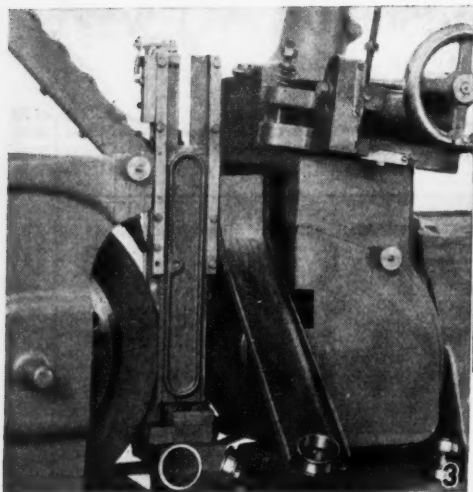


Fig. 3—A Centerless grinder set up for grinding bearing races. Hydraulically-operated fingers place one piece at a time between the wheels and elevate the finished piece to an opening through which it passes to the receiving pan.
Fig. 4—Reverse side of machine, showing work-feeding attachment.

chine can be gained by visualizing the difference between a hypodermic needle of .015 inch diameter and two inches long and a solid bar of steel four inches in diameter and 18 feet long—either of which can be ground on the centerless grinder.

Furthermore, the production possibilities of centerless grinding have been raised to the maximum by the use of special work-holding attachments, chutes, work-feeding attachments, hydraulic devices, and so on. New applications are constantly being developed. An example which typifies the manner in which the centerless grinder can be advantageously used is shown in Fig. 1, where a Cincinnati centerless grinder can be seen grinding the bakelite caster rollers illustrated in Fig. 2. A chute is provided into which the pieces are placed by the operator. Underneath the chute is a cage fixture containing a number of compartments into which the pieces drop as the cage revolves, the fixture consisting of a shell in which the regulating wheel revolves, although in the opposite direction.

Each compartment has its individual support blade, thus providing the three points of contact. Each piece in turn is ground as the cage revolves, afterward falling out of the cage into a chute which leads to a

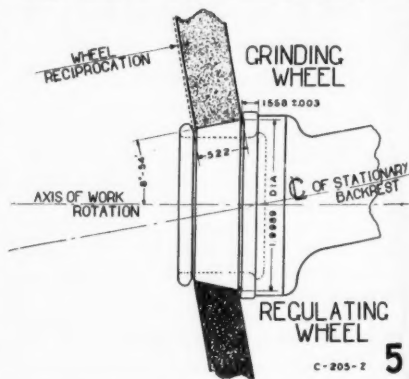


Fig. 5—Drawing showing contact of work and wheels.

receiving pan. The net production on this job is 3,200 pieces per hour.

Among the attachments which have been developed for handling work of

High-speed grinding pays Profits...

and "SAFETY" equipment stands the pace

"SAFETY" grinding machines and wheels make high speed grinding *practical and safe*. They're built to stand the pace. In fact the many "Safety" developments in this line have done much to advance the present trend to high-speed grinding.

These are some of the reasons why the Bay City Electric Steel Castings Co., for instance, has adopted SAFETY grinding machines and wheels as standard equipment. This high speed equipment is showing real savings, cutting costs and increasing production in the Bay City plant.



THE ONLY GRINDER OF ITS KIND IN THE WORLD

There's no other grinder in the world like the "Rite-Speed" Grinder. For it automatically enforces an increase in speed as the wheels wear down. Yet this increase in speed is accomplished *mechanically*—not electrically. This permits the use of a constant speed A. C. motor—it can't "run away"—and no D. C. variable-speed equipment complications are involved.

Write for Complete Information

Learn all about the Safety "Rite-Speed" Grinder. Get the facts about "Safe-T-Bond" high-speed wheels—the peer of all Bakelite bonded wheels. Just pin the coupon to your letterhead and mail it—today.



THE SAFETY GRINDING WHEEL & MACHINE COMPANY

2394 COLUMBUS AVENUE, SPRINGFIELD, OHIO

The Safety Grinding Wheel & Machine Company
2394 Columbus Ave., Springfield, O.

I would like to know more about
() The "Rite-Speed" Grinder
() "Safe-T-Bond" high-speed wheels

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(Name of Individual)

Pin this to your letterhead.

awkward shape is the hydraulic elevating attachment shown in use in Fig. 3. The part in process is a bearing race, which is loaded into an inclined chute, from which each piece in turn

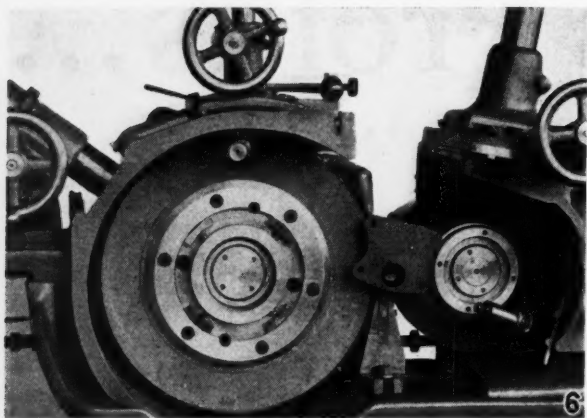


Fig. 6—The diameter, fillet and face of a spring hanger bracket are ground with this equipment. Two cuts are taken and the production is 80 per hour, net.

is removed by hydraulically-operated fingers and placed on the support blade, between the wheels. A rear view of the machine, showing the handling attachment, is shown in Fig. 4. As each piece is placed in position, the work, together with the regulating wheel, is advanced to the grinding wheel in the position shown in Fig. 5. Upon completion of the cut, the automatic infeed attachment withdraws the loading fixture and regulating wheel from the grinding wheel, the finished piece then being elevated by the fingers of the hydraulic attachment to an opening through which it passes to the receiving chute. From .012 to .016 inch of stock is removed, the piece being held to limits of plus or minus .0002 inch, both for roundness and size. Two cuts are taken, the net production being 190 pieces

per hour. An excellent finish is obtained.

An example of a shoulder-grinding job is illustrated in Fig. 6, where a machine is shown set up to grind spring hanger brackets. The operation consists of grinding the diameter, fillet and face of flange, removing approximately .010 inch of stock and holding the piece to within .001 inch of size and .0002 inch for roundness and straightness.

In this case, to overcome any possibility of out-of-balance forces affecting the firm contact of the piece with the work support and regulating wheel during the cut, an overhead pressure shoe is employed. The machine is also equipped with a hand-controlled reciprocating attachment so that upon completion of the cylindrical grinding

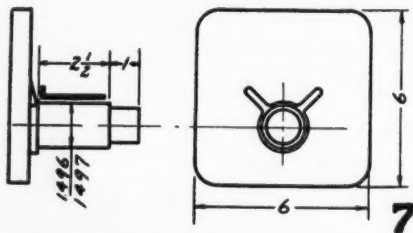
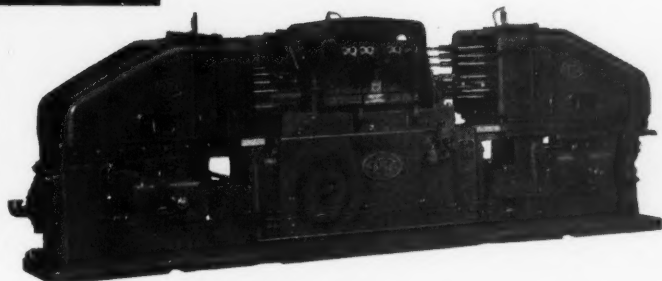


Fig. 7—Drawing of spring hanger bracket shown in process in Fig. 6.

operation, the actuation of the hand lever moves the grinding wheel axially towards the flanges to insure accurate face grinding on the flange.



60 CYLINDER BLOCKS DRILLED EVERY HOUR

THE above machine is a three-way Horizontal Hydraulic Driller built up of three standard NATCO Type C-6" Hydraulic Drilling units. It is equipped with the NATCO Hydro Uni-power system of Hydraulic feed, being semi-automatic in operation, the operator starting all units simultaneously by pulling one air starting valve.

This machine is used in one of the country's most modern automobile plants for drilling a total of 36 holes in the two ends and one side of a "V" type cylinder block.

NATCO PRODUCTS

Standard Adj. Multiple Drills
Fixed Center Multiple Drills
Single Purpose Automatic Drills

Hi-Duty Single Spindle Drills
Drillers and Tappers
Special Machines

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U. S. A.

A special wheel-truing attachment is provided for truing the side of the wheel. Two cuts are taken, with a net production of 80 pieces per hour.

An interesting application of the centerless grinding machine for finishing work which is both out-of-balance

proximately .025 inch of stock. Only one cut is required and the pieces are ground at the rate of 250 per hour.

The adaptability of this type of machine for grinding odd-shaped work is shown in Fig. 9. Here a machine is shown set up to grind brass

faucet pipes, which were finished formerly by comparatively slow hand polishing methods. The piece is ground by the in-feed method, provision being made for quickly and conveniently placing the work between the grinding and regulating wheel by means of a cam arrangement which increases the spread between the wheels.

The grinding wheel must be trued to shape, which is accomplished with a diamond tool. The radial movement of the diamond relative

to the axis of the grinding wheel is controlled by a cam which is profiled to the shape of the work to be ground. An auxiliary boosting lever for the grinding wheel profile attachment is used to move the follower over the steep angles of the cam. Only one cut is taken on each piece, approximately .100 inch of stock being removed to obtain the required finish. A production rate of 150 pieces per hour is maintained.

In general, the centerless grinding machine offers the following principal advantages:

1—As the grinding process is carried on continuously in the through-

(Continued on page 63)

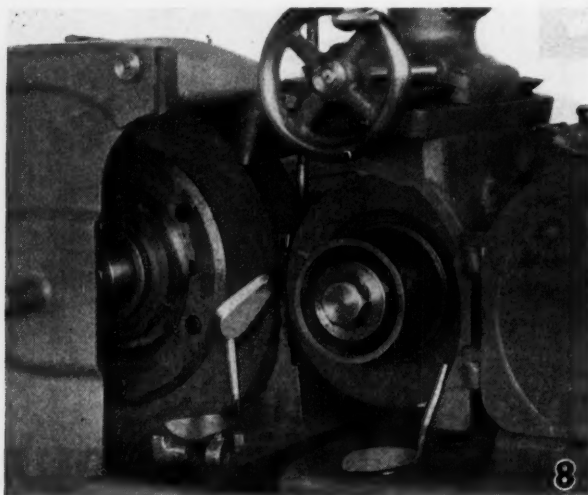


Fig. 8—Golf club heads, both out-of-balance and tapered, are being finished with this machine. Approximately .025 inch of stock is removed and the pieces are finished at a rate of 250 per hour.

and taper is shown in Fig. 8, where a job of grinding the shanks of golf club heads is shown in process. This type of work is ground by the in-feed method, the work being maintained in contact with the work support blade by means of an overhead pressure shoe. This arrangement overcomes any tendency of the out-of-balance end of the piece to affect the accuracy of the operation. The application and release of the pressure shoe is coordinated with the motions of the in-feed lever, thus relieving the operator of any additional duties. The piece is a rough steel forging, and the specifications call for a smooth finish, which necessitates the removal of ap-

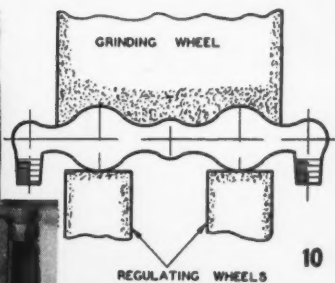
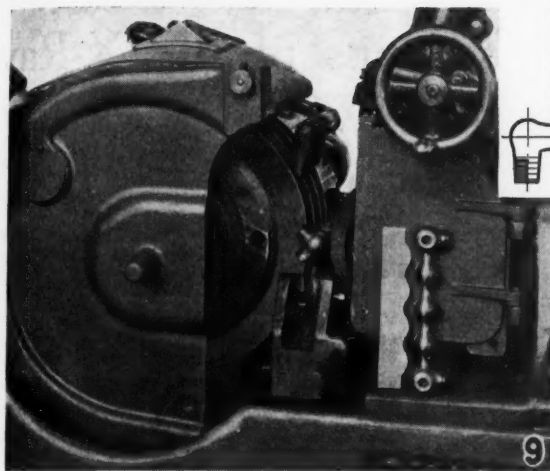


Fig. 9—150 faucet pipes per hour are finished with this equipment. The grinding wheel is trued to shape by means of a diamond that is controlled by a cam which is formed to the shape of the work. Fig. 10 — Cross-section drawing showing relation of work and wheels.

Centerless Grinding

(Continued from page 58)

feed method or approaches continuous operation in the in-feed method, the idle machine time is negligible.

2—The work is rigidly supported directly under the grinding cut as well as through its entire length, preventing any deflection during the grinding operation and allowing, if necessary, a heavier cut to be taken.

3—No axial thrust is imposed on the work while grinding. This absence of end pressure makes possible the grinding of long, brittle pieces and easily distorted parts.

4—As a true floating condition ex-

ists during the grinding process and the error of centering is eliminated, less grinding stock is required, with correspondingly increased wheel life.

5—The possibility of error in setting up the job is reduced, because stock removal is measured on the diameter and not on the radius. Unskilled labor can be employed for the operation of the machine after it has been set up, as the rest of the operation consists of loading the machine. The saving of labor is especially pronounced where a battery of centerless grinders equipped with automatic feeding devices is used, as one man can attend to several machines.

Second National Machine Tool Builders' Exposition

The Second National Machine Tool Builders' Exposition of the National Machine Tool Builders' Association, will be held in the Public Auditorium, at Cleveland, September 30 to October 4, 1929.

The exhibit will comprise machine tools, equipment, supplies, materials, small tools, processes, and methods related to the industrial application

of the tools and supplies. The first exposition, held in 1927, drew an attendance of more than 10,700 mechanical executives, buyers, users, engineers, and technicians, and an even larger attendance is anticipated this year. All persons coming within these classifications are invited to attend without charge, but the general public will not be admitted.

Practical Applications of the X-Ray In Metal-Working

By GREGOR S. AFFLECK
Metallurgist, Aluminum Industries, Inc.

THE examination of castings for internal flaws and defects by the use of the X-ray machine, although a comparatively recent development, is creating a great deal of interest and promises to become an important operation in the fabrication of metals.

The ability to look through the wall of a casting and discover the presence and location of defects is removing the guesswork from forging and casting inspection, and is making it possible to make sure of the soundness

This article is published in response to a number of inquiries for additional information which were received as a result of the publication recently, in these columns, of an article which discussed the uses of the X-ray machine for casting inspection.

of castings upon which, as in the case of airplane work, lives may depend.

As the apparatus required for radiography, or the taking of X-ray photographs, has already been described in these columns, this article will be confined to a discussion of practical applications of the X-ray and the results that can be obtained. Among the advantages of this method of inspection are these:

1. The X-ray makes it possible to determine the internal soundness of

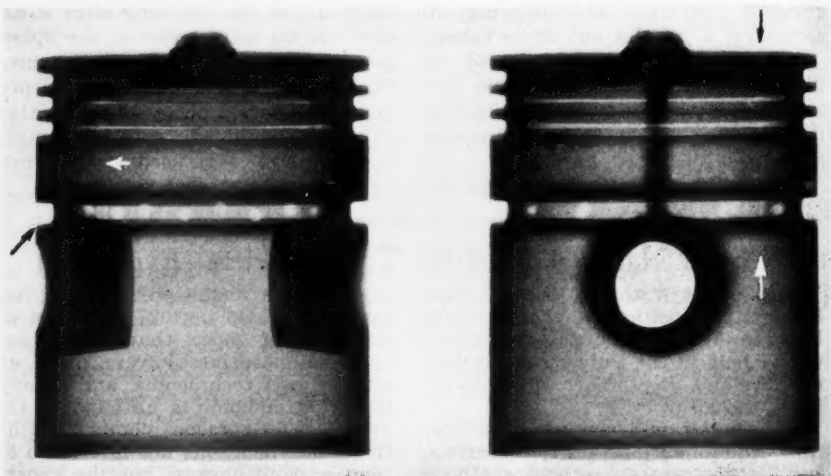


Fig. 1—Defective automobile piston. Note porosity at points indicated by arrows.

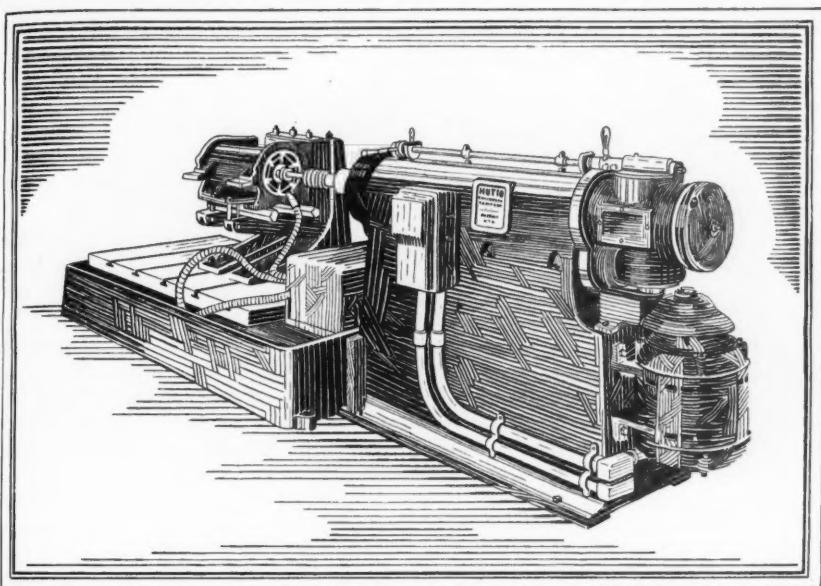


Illustration shows Hutto "MJ" Machine adapted to the grinding of cylinder bores up to 10 inches in diameter and a maximum length of 55 inches

You can lick any job of cylinder grinding with HUTTO equipment

HARD metal—soft metal, diameter and length of bore, close limits and quantity production—are not handicaps. There is a Hutto Grinder and Machine for every cylinder job over three-fourths of an inch in diameter and any length.

The Model "MJ" Machine (illustrated) is especially adapted for grinding cylinders 3 to 10 inches in diameter and up to 55 inches long.

Special Hutto Grinders used with Hutto Machines will enable the operator to maintain the closest possible accuracy limits for straight and round.

The amount of production is, of course, directly related to the diameter and length of the cylinder bore, the material and amount of stock necessary to remove.

Descriptive literature will gladly be furnished on request. Our engineering facilities and experience are available at all times without obligation and an analysis of any internal grinding problem will be cheerfully given.

Experienced factory representatives are always available to install Hutto equipment and properly instruct the operator in its use.

HUTTO ENGINEERING COMPANY, Inc.

542 LYCASTE AVENUE

DETROIT, MICHIGAN

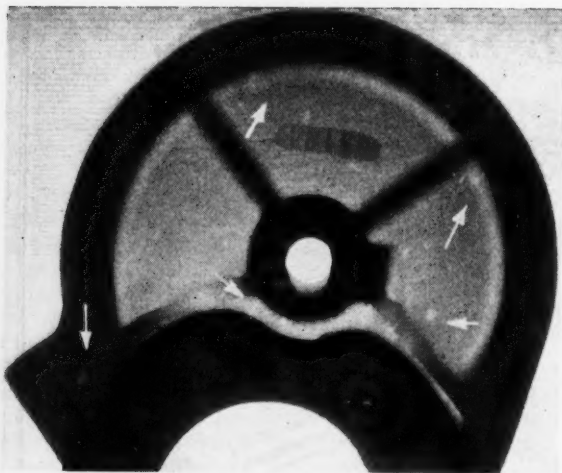


Fig. 2—Timing chain housing cover, sand cast. Note gas inclusions and generally porous condition.

a casting without injuring the casting.

2. Dangerous flaws, which might cause failure at a critical time, can be detected before the part is put into service.

3. Flaws which might cause rejection after an expensive machine has been assembled can be located before the part is used.

4. Knowledge of the size, location, and number of internal defects makes it possible to remedy such defects by changes in the methods of gating, resulting in the production of good castings.

5. Knowledge of the condition of the interior of the casting will make possible the use of smaller sections, with resultant lower costs.

6. In castings which are difficult to pour and where flaws cannot be avoided, conditions can be adjusted so as to have the flaws located where they will do the least harm.

Inclusions of gas and dirt are ruinous to a casting, but they are not easy to locate by the visual method alone, therefore this is one of the factors for which the X-ray is particularly valuable. The practice of cutting or breaking castings is far from satisfactory, as it

is impossible to examine the entire casting by this method and most often the flaws will be located in

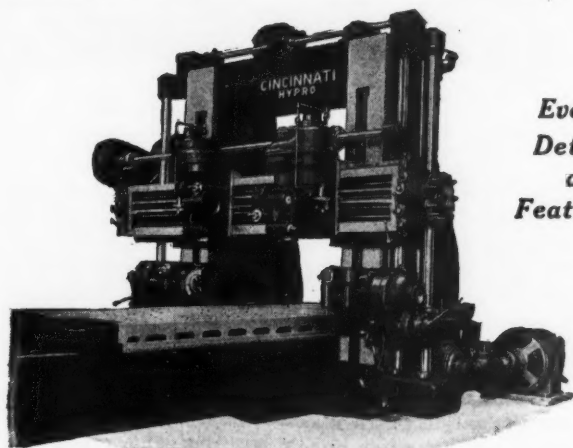


Fig. 3—Section of aircraft motor crankcase. Arrows indicate large cavities due to shrinkage and poor foundry practice.

another part of the casting.

Often gates and risers are placed by the foundryman without apparent

NEW CINCINNATI HYPRO PLANER MILLER



*Every
Detail
a
Feature!*

Frictionless and vibrationless drive through Silent Chains

Both the vertical feeds and the two transverse milling heads of this new Cincinnati Hypro Planer Type Miller are efficiently operated through Silent Chain drives.

This patented silent chain insures a smooth flow of power to the cutting tools at all speeds.

Ask Hypro Engineers to detail this and the many other features of the Hypro Planer Type Miller.

Other features of the Hypro Planer Type Miller:

Complete Electrical Control.
Independent Rapid Traverse to All Heads.
Independent Power Feed to All Heads, Rail and Table.
75 Feed and Spindle Speeds.

THE CINCINNATI PLANER CO.

3100 SOUTH STREET

CINCINNATI, OHIO

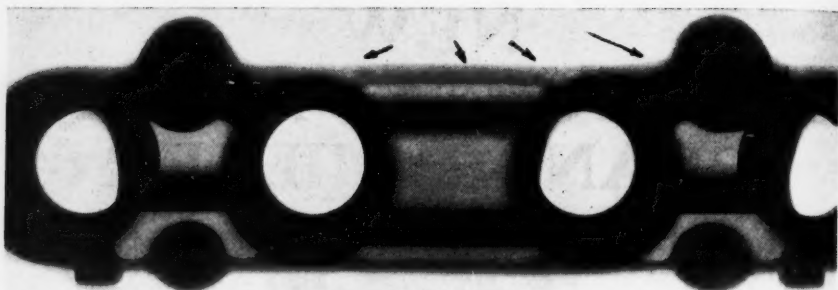


Fig. 4—Radiograph of a defective valve lifter guide. Arrows indicate porous condition, which was eliminated by changing the method of gating the castings.

sense or reason. He is guided by past experience alone, and in many cases this experience is far from scientific. The placing of chills to eliminate "shrinks" or "draws" is comparatively easy, because such defects make themselves apparent on the surface. Sometimes it is necessary to use chills to obtain other results than the elimination of shrinks and draws. Sand castings often have a granular appearance under the X-ray, which is due to very minute gas inclusions. Increasing the size of the chills will help to eliminate this condition in the heavier sections.

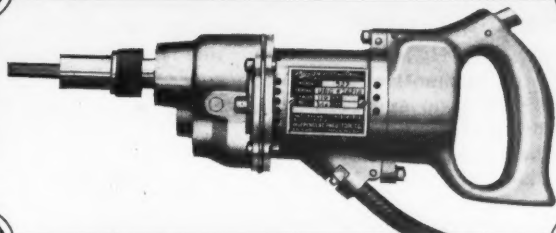
Upon going into production on valve lifter guides for a high-grade automobile, we resorted to the use of the X-ray to determine the soundness of our castings. In the first castings we found the metal porous adjacent to the gates. This condition was remedied by altering the gates and method of joining. On another occasion, periodical inspection by means of the X-ray disclosed the fact that gas inclusions were more prevalent during cold weather. This trouble vanished when the pouring temperatures were raised some fifty degrees, which prevented too rapid cooling of the metal in the mold.

In making radiographs of large parts, such as crankcases, it is advisable to survey the piece by taking individual radiographs of the sections in which the faults are most likely to occur. As a defective casting may mean the failure of an aircraft motor at a critical time, some of the more progressive builders of such motors have each crankcase, connecting rod, and other important parts radiographed before they are assembled to a motor.

It is always possible, of course, to learn from failures, but such a method is usually painful and expensive. Waiting for failures which never happen or being suddenly confronted with the responsibility for an expensive failure both take the joy out of working, and anything that promises to lessen the grief of the foundry or manufacturer is sure to be welcome. The X-ray is, therefore, finding favor in those plants where quality is the first consideration, either as a policy or a necessity, and new applications of this modern tool are constantly being developed.

Mention MODERN MACHINE SHOP when writing advertisers. You will be co-operating with us, and then we can co-operate better with you.

What IS YOUR SCREW DRIVING PROBLEM?



Let *Thor* Electric Screw Drivers Increase Production and Reduce Costs ~~~

DRIVING screws is an important operation in the manufacture of most products, and manufacturers are realizing that here is one operation where costs may be reduced considerably.

We have thoroughly studied screw driving problems, and have placed in successful operation numerous attachments for driving screws in unusual places. We have attachments for all rough open screw driving as well as attachments that have "Bell-Mouth" Finders, which instantly locate the screw slot and hold the bit in it so that finished surfaces are not marred. There are attachments in the Thor line that have an additional set of

clutch jaws, operated by spring tension, which may be set to drive screws to any predetermined tension. The secondary clutch jaws slip after driving the screw to the desired tension, leaving nothing to the judgment of the operator. We also have angle attachments from 15 to 25 degrees that get into the most inaccessible places, where it is impossible to use a regular attachment.

If you have any difficult screw driving problem, our engineers are at your service. Let them co-operate with you. Send us sample of screw used, size of lead hole and space surrounding operation. This places you under no obligation.

TOOLMAKERS SINCE 1893

INDEPENDENT PNEUMATIC TOOL CO.

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236 South Jefferson St.
CHICAGO, ILL.

ELECTRIC
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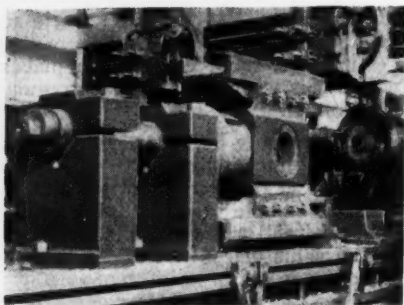
Ideas From Readers

This department is a clearing-house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay \$5 for each one published.

Locomotive Crosshead Planing Fixture

By H. H. HENSON

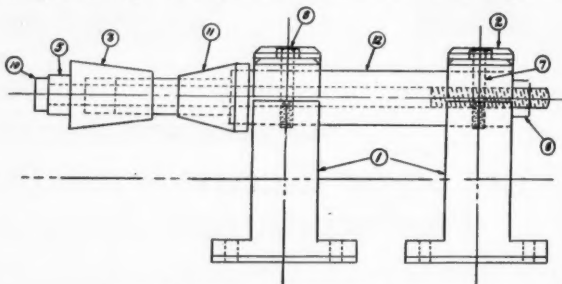
Any size of locomotive crosshead can be quickly set up and planed by using the fixture shown in the illustrations. This fixture also does away with the necessity of having a dozen or more different sizes of arbors or mandrels on hand to fit the different sizes of taper holes for the piston rod fits; the adjustable mandrel will fit any taper hole and will also align the crosshead on the planer table.



Crosshead planing fixture set up for operation.

The fixture consists of two V-blocks, a mandrel, two cones, and a draw-bolt. The V-blocks are of cast

iron and are heavy enough to insure rigidity when planing the large, heavy crossheads, thus eliminating tool chatter. The mandrel and two cones are made of a good grade of steel, case hardened. The taper on

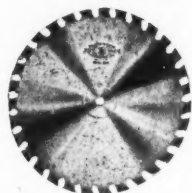
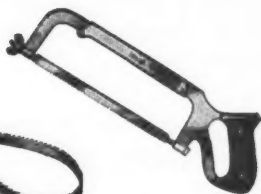


Drawing showing construction of fixture.

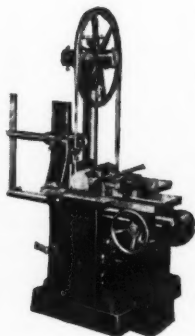
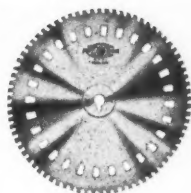
the cones is such that they will fit any of the piston rod holes in the crossheads. Setting up by means of these tapers enables the operator to draw up the crosshead quickly and easily to the correct working position.

To set up a crosshead on the fixture, the drawbolt (10) is removed, also the cone (3). The crosshead is then placed in position on the cone (11), after which the outer cone (3) is slipped over the end of the mandrel and into place. The drawbolt (10) is now slipped back into place and the nut (6) is put on and tightened. The cones center the piece properly and align the crosshead so that it will not bind on the guide bars when in operation. The V-blocks are each 12 inches square at the base and are keyed at

ATKINS METAL CUTTING SAWS

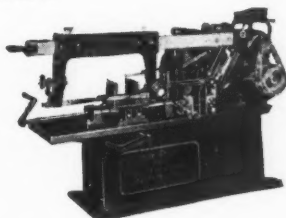


ANY user of our Metal Cutting Machines will tell you that Atkins Machines are "The Finest on Earth." The quality in Atkins products is of the highest standard, therefore results follow. Built to high quality standards, not down to a lowly price basis.



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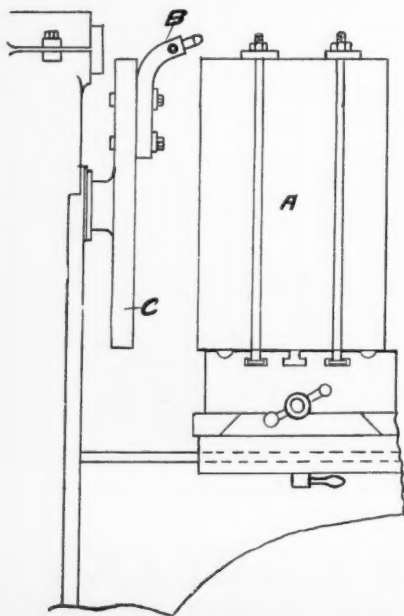
E. C. ATKINS & COMPANY
428 So. Illinois Street INDIANAPOLIS, INDIANA

the bottom to insure alignment. The drawbolt is $39\frac{1}{2}$ in. long and $1\frac{1}{8}$ in. in diameter. The arbor bushing (11) is $4\frac{3}{16}$ in. long by $5\frac{1}{4}$ in. diameter at the large end and $3\frac{1}{8}$ in. at the small end, while the shell (3) is $6\frac{1}{4}$ in. long, $5\frac{1}{4}$ in. diameter at the large end and $3\frac{3}{4}$ in. at the small end. The arbor is $30\frac{1}{2}$ in. long, with $21\frac{3}{4}$ in. of $4\frac{1}{4}$ in. diameter, and $8\frac{3}{4}$ in. of $2\frac{3}{4}$ in. diameter.

Milling with an Armstrong Toolholder

By CHARLES KUGLER

THE cast iron pattern indicated at A on the drawing was brought in to be machined at a time when there was no face milling cutter available, so we machined the side of it by using an Armstrong toolholder (B),



which was clamped to a faceplate (C). By using a fine feed, the job was done in a satisfactory manner, although the time consumed was longer than would be required if a planer or shaper were used.

Circle Cutter For Paper Templates

By L. COON

A **CIRCLE** cutting device can be developed that can be inserted into the end of a compass for cutting circles and templates of paper.

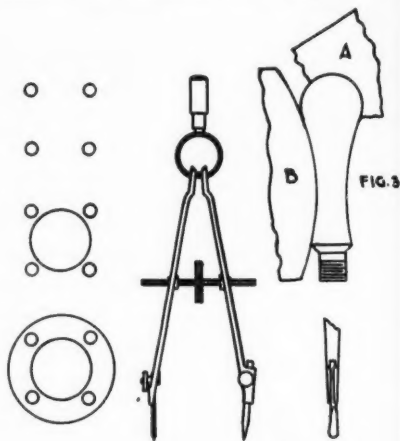


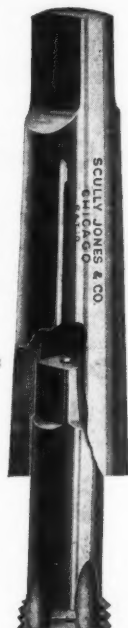
FIG. 2.

FIG. 1.

Circle Cutter for Paper Templates.

Fig. 1 shows how cutter is inserted into compass. The cutter is made of .070 steel music wire. It is flattened, then filed to the shape of the desired cutting point. A chisel point will serve most any purpose. Have the cutter hardened and ground to get the required edge for cutting.

Fig. 2 shows how gaskets and washers can be cut to suit the requirements. Fig. 3 shows how templates can be cut to find the curvature



"DRIVE BY THE SQUARE" **"CENTER BY THE SHANK"**

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"WEAR-EVER" TAP CHUCKS

- 1. One-piece tool.**
- 2. Better Work.**
- 3. More Tapped Holes.**
- 4. Less Tap Breakage.**

* Section removed to show position of tap in chuck.

This tool is making money for big and little concerns wherever used.

STOCK SIZES of "Scully-Jones" Chucks ranging from No. 0 to No. 5 Morse Tapers drive all size straight shank tools up to 1½" diameter, will be gladly sent on approval.

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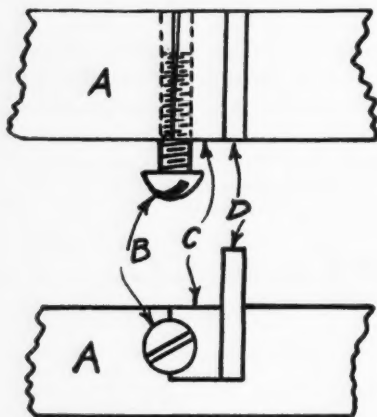
BUFFALO, N. Y.
R. C. Neal Company, Inc.
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of any shape. Fig. A shows a concave templet and Fig. B shows a convex templet used to find the curvature of a tool handle. Sometimes a series of cut curves will give the profile of an irregular shaped object.

An Effective Fastening

By R. H. KASPER

THE sketch shows a method of fastening an insert in a bar which is very effective on small parts. The object is to fasten the insert **D** securely in the bar **A**, but so that it may be easily removed. This is accomplished in the following manner: bar **A** is grooved to take the block **C** in addition to the insert **D**. Block **C** is made somewhat wider than actually required. With block **C** clamped against one side of the groove in bar **A**, a drill and tap are run through so that one-half of the tapped hole will be in **A** and half in **C**. Block **C** is then ground slightly tapered, the metal being removed from the side having the tapped half-hole. As the



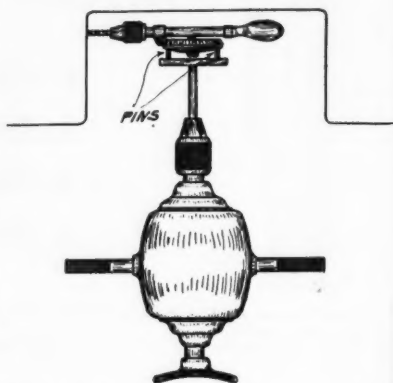
screw **B** is turned in, the taper effect formed in the tapped hole by the

grinding of block **C** causes **C** to be wedged tightly against the insert **D**. In the sketch, the taper on block **C** is exaggerated; about .005 inch taper will give a powerful clamping effect.

Drilling In Close Quarters

By R. H. KASPER

HAVING a number of holes to drill in a recess on a machine part, it was found impossible to do the work on a drill press, and the shortest elec-



Using an electric drill to operate a hand drill in close quarters.

tric drill was too long to enter the recess. The only tool which could be used was a small hand drill, which would mean hours of laborious work if operated in the usual manner. The work was rapidly completed by the method shown in the sketch. The handle was removed from the hand drill and two holes were drilled near the outer edge of the driving bevel gear. A driving dog, carrying two pins to fit the holes in the gear, was held in the electric drill, furnishing the power for driving the hand drill, as shown.

ELIMINATE TAPPING WITH THESE UNIQUE SCREWS



"Better . . . and cheaper" than machine screws

And the maker of this valve grinder makes easier, quicker assemblies with Hardened Metallic Drive Screws.

Machine screws were formerly used for fastening the cover plate to the body of the Prompto Valve Grinder. A test proved that Hardened Drive Screws offered a better, cheaper way.

The adoption of these unique Screws, which cut their own thread in the material as they are hammered into a drilled hole, eliminated slow and costly tapping formerly necessary. Now, unskilled workmen make the assembly

—quicker, as well as cheaper. And scrappage resulting from stripped and crossed threads was eliminated along with tapping.

More than 20,000 manufacturers have tested and adopted Hardened Drive Screws for making permanent fastenings to iron, brass and aluminum castings, steel, Bakelite, etc. Hundreds of applications prove the security of assemblies made with these Screws.

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Please send a handful of Hardened Metallic Drive Screws. I want to try them for

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MODERN MachineShop

HOWARD CAMPBELL - - Editor

American Wages In Europe

IT IS a matter of common knowledge that the wages paid to workmen in Europe are much lower than the wages paid for the same classes of labor in the United States. The relatively high wage paid to the American workman can be credited to the natural richness of the resources of this country, the development of these resources by American engineers, whose methods are being imitated by the rest of the world, and a protective tariff wall which has kept the products of foreign labor out of American markets.

Our most representative export is the automobile, which is preferred by car owners abroad. In order to protect and develop their own industries, European countries are continually increasing their import duties. Some of the foreign statesmen are now threatening to increase the tariff to a point that will prohibit the importation of American cars to those countries. The most important result of this threat has been, thus far, an announcement by Henry Ford that he may build more factories in European countries, manufacture Ford cars there according to American methods, and pay the native workmen the equivalent of the American scale of wages.

With a number of huge factories operating in Europe, employing thousands of workmen at double or triple the usual wage scale, it is obvious that wages in general would take an upward trend. Such an event would undoubtedly have an effect on the welfare of our European neighbors

that could be accomplished by no other means, tending, as it would, to raise the general standard of living among the working classes on the other side. And the benefits of high wages "over there" would be felt by both the workman and his employer over here.

On the Value of Exchanging Ideas

CERTAIN remarks made to us by the works manager of a large plant, recently, anent the subject of publicity, seem to us to be worth passing on. He said, in discussing the publication of an article describing certain new methods that had been developed in his plant, "I believe that publicity of this kind is a good thing for everyone concerned. It is good for the plant, and good for the reader. We are glad and proud to show anyone through our plant; why shouldn't we be just as glad to tell others—who may not be able to get here—what we are doing that is interesting? The man who is anxious to keep abreast of developments in his industry should contribute his share, and the man who is afraid that others will find out what he is doing is usually away behind the times anyway, and doesn't know it. The manufacturer or engineer who co-operates in the right spirit will always receive as much as he gives. I have never found that helping the other fellow made my job any harder; on the contrary, the development of the industry increases business and makes the task easier for everyone."

Considering that the above expression came from a man who directs operations in one of the country's largest and most progressive plants, it may give an indication of the mental qualities which have made him a success as an executive.

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High Speed Sensitive Drill

—“Gangs” up to 6 Spindles—

**SENSITIVE
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**ACCURATE
ADAPTABLE**

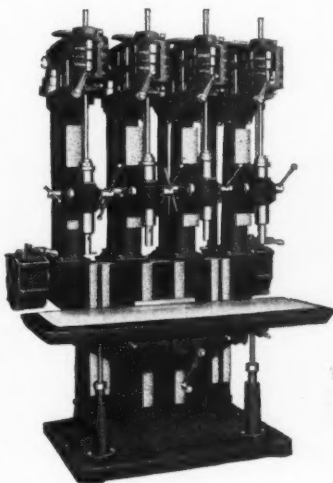
Ball Bearings on all revolving parts.

Spiral Gear Drive; hardened spiral gears running in oil.

Patented Belt Shifting Mechanism, using a central cam drum, controlled by crank.

Four-cone pulley gives four speeds. Range of three sets of speeds to choose from.

Channel for chips and lubricant around table.



Spindle of Chrome Nickel Steel, accurately ground.

Spindle Sleeve is supplied with one thrust and two radial ball bearings.

Head is adjustable and can be clamped in position.

Power Feed. Four geared feeds for each spindle. Feed-engaging clutch and all gears are enclosed.

Patented Tapping Attachment is clamped to quill or sleeve and is disc-driven.

Developments far ahead of general practice in building machines of this type are embodied in the design on this machine. Especially intended for use on the rapid, accurate drilling operations met in modern high-production manufacturing plants.

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CINCINNATI, OHIO, U. S. A.

New Shop Equipment

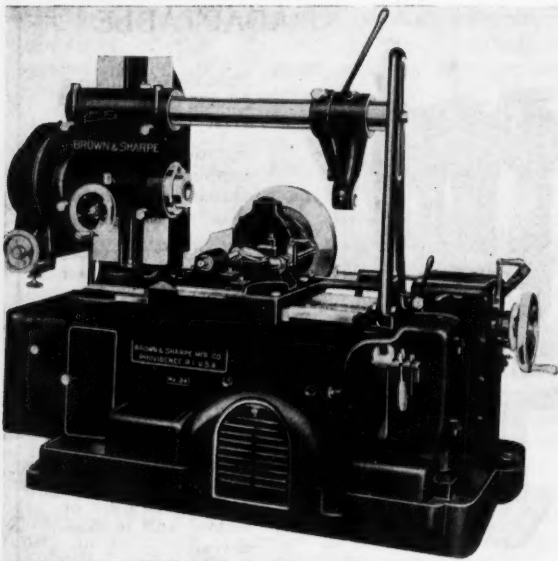
Brown & Sharpe No. 34 Gear Hobbing Machine

The Brown & Sharpe Mfg. Company, of Providence, R. I., has recently announced the redesign of the No. 34 Gear Hobbing Machine and the incorporation of several new features. The machine

accessible for oiling and adjustment. The machine can also be driven from the overhead works and when so driven, a 4-inch belt running at a constant speed of 500 r. p. m. is used.

The oil filter is located at the rear of the machine where it can be easily cleaned. Oil is pumped from the feed case through the filter and to the indexing mechanism and the feed case bearings, from where the overflow is drained back to the feed case supply. The hob slide is oiled from one station for both the feed screw and the ways.

The cutter coolant pump, located at the rear of the feed case, is readily accessible. It is driven by a chain from the driving pulley shaft and can be easily disconnected when cutting cast iron. The indexing mechanism, the driving pulley shaft, and the hob driving shaft are carried on anti-friction bearings, assuring economy of power transfer.



Brown & Sharpe No. 34 Gear Hobbing Machine

is now of the motor-in-base type and is equipped with an oil filter. The oiling arrangement has been simplified and the cutter coolant pump has been relocated. Anti-friction bearings are used at important points throughout the machine.

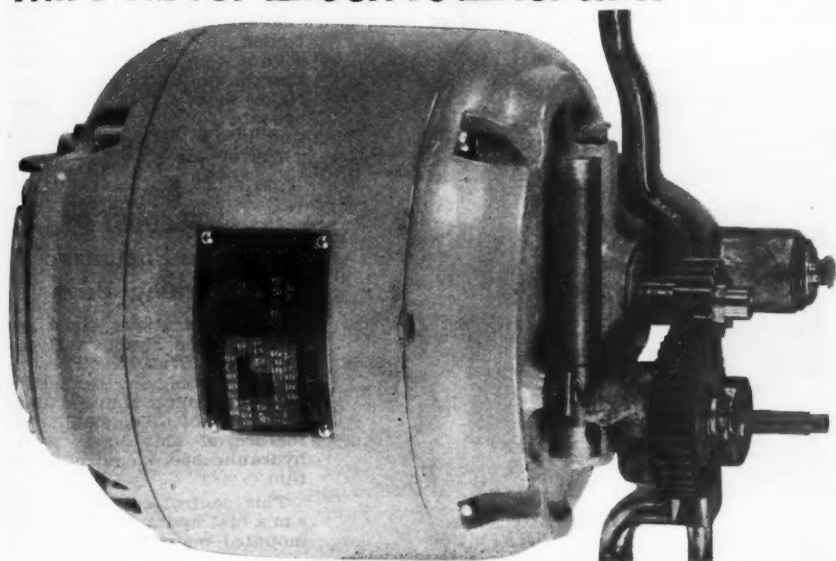
The motor-in-base arrangement provides an economy of floor space, the motor being completely enclosed in a compartment in the base, yet readily

Cincinnati H. D. Shaper

Two new Cincinnati Shapers will be shown by the Cincinnati Shaper Co. at booth number 2-W-17, at the Machine Tool Builders' Show, in Cleveland, in September. One is a 24-inch heavy duty shaper, and the other is a 16-inch heavy duty shaper, both of which machines will be equipped with built-in power rapid traverse to the table.

The 16-inch shaper will be equipped with the Cincinnati universal table, which is a revolving table with a tilting top, without hinges, jacks or table support. The cutting speeds have been increased, giving it the highest number

This Master Electric Exerciser



is FORMICA Driven

PARTICULARLY in machinery to be used around the home and the store is silence desirable and that is why the Master Electric Company is using Formica gears in this new exerciser.

Silent operation makes machinery easier to sell. It is desired by maintenance men because silent material sounds well taken care of.

Formica gear cutters everywhere can give prompt service on replacement gears of Formica.

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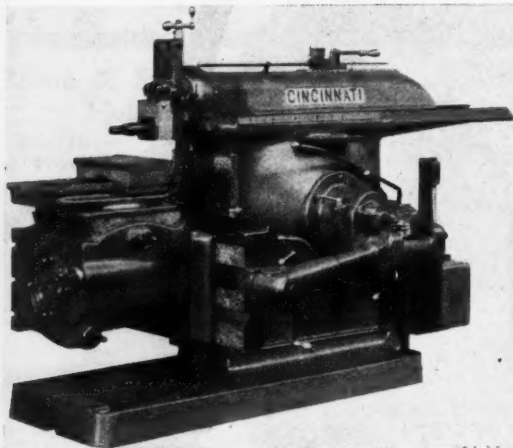
4632 SPRING GROVE AVENUE

CINCINNATI, OHIO

FORMICA

of strokes per minute of any shaper ever built by this company.

A new combination tool tray and cross rail guard will be shown on this shaper. Timken thrust bearings on each end of



Cincinnati Heavy Duty Shaper

the cross feed screw have replaced the usual bearing method and make the table as light as a feather to hand feed. A unique feature of this new shaper is the construction of the ram bearings. These bearings now extend to the end of the ram and reduce overhang from the cutting tool to the ram bearing by 2½ inches.

All of these new features are also built into the 24-inch heavy duty shaper. This machine will be equipped with a full box table and the heavy, accurate cuts which can be taken on this machine will be demonstrated by the size of the chips coming from the work.

Cincinnati Gear Burnisher

A new gear burnisher will be shown by the Cincinnati Shaper Company, at the Machine Tool Builders' Show, in Cleveland, in September, booth number 2-W-17.

Burnishers previously made by this company handled gears up to seven inches in diameter. The new burnisher handles gears up to 12 inches in diameter and may be arranged to take gears of much larger diameters.

One particularly worth-while feature of the new Cincinnati gear burnisher is the special method of counterweighting. The pressure with which the burnishing gears engage the green gear is controlled by means of these counterweights, thus permitting a movement of the carriage slide sufficient to compensate for any small variation in the pitch diameter of a run of gears.

Hannifin Hydro-Pneumatic Broaching Press

The illustrations show two views of the Hannifin Hydro-Pneumatic Broaching Press recently placed on the market by the Hannifin Manufacturing Company, of Chicago, Ill. The feature of this press is the hydraulic speed control of the ram.

This control consists of two small hydraulic cylinders mounted on either side of the

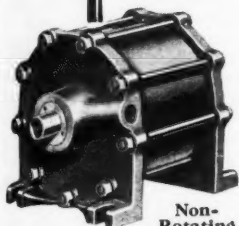


Cincinnati Gear Burnisher

"LOGAN"

Air Operated Devices

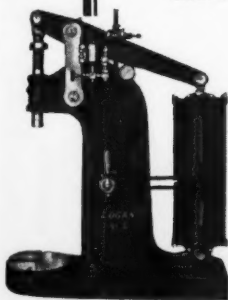
Combine maximum production with minimum waste in time, effort, and motion!



Non-Rotating Cylinders



Three Jaw Chuck



Arbor Presses

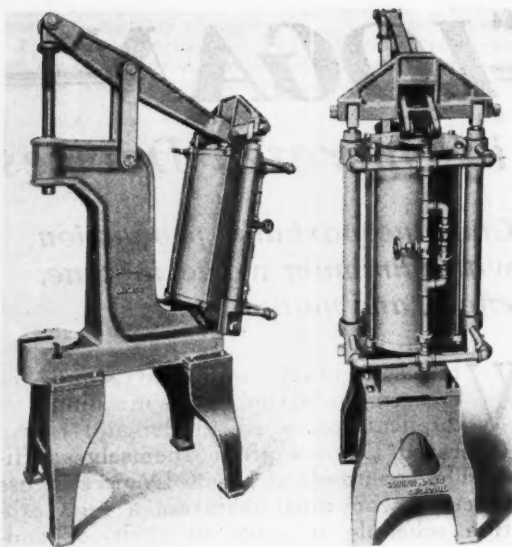
WHEN accuracy, uniformity, and increased production in the machining of duplicate parts are in demand Logan Air Operated Devices prove themselves efficient. The thousands of Logan Devices in use by concerns who must maintain a high production schedule is proof of their dependability.

There is a "LOGAN" Air Operated Device adaptable to all types of production machines to meet every work holding requirement fully described in Catalog R-23.

Send for your copy now. It may contain a solution to the very work holding problem that is before you.

A complete line of Logan Air Operated Devices will be displayed at the National Machine Tool Builders' Show, Booth 1-W-9. Be sure to see them.





(Left)—Hannifin Hydro-Pneumatic Broaching Press.
(Right)—Rear view showing Control Cylinders of the
Hannifin Hydro-Pneumatic Broaching Press.

air-operated power cylinder. The piston rods of the hydraulic cylinders are connected to the piston of the air cylinder by means of a cast steel cross arm. The control is accomplished by regulated transfer of oil from the top to the bottom of the hydraulic cylinders. During the power stroke the oil passes through a needle valve which can be regulated to any desired speed. On the return stroke, the oil passes through a swing check which permits the ram to return to the top of the stroke at full speed.

It is claimed that the result of the oil cylinder speed control is a perfectly smooth, uniform travel of the ram at any desired speed without loss of power. The manufacturer of this machine states that it is most efficient for broaching short holes which can be finished with broaches not exceeding 12 inches in length, but is not designed for broaching operations which require long broaches.

Hannifin Air Operated Rivet Press

The Hannifin Manufacturing Company, Chicago, Ill., has recently brought out a new rivet press, the outstanding feature of which is the fact that no moving part is exposed, except the ram. The design and construction are so simple that only five points require lubrication, for which Alemite fittings are provided.

The press operates on the wedge principle; that is, a wedge of predetermined angle is driven between two predetermined roller bearings mounted in the frame and a roller mounted in the top of the ram. The initial two inches of the ram movement provides a rapid approach. The final movement or power stroke of the ram is one inch in length. These two movements are secured by a very steep angle on the wedge, followed by a second angle.



Hannifin Horizontal Type Rivet Press

OHIO SHAPERS

Represent the highest type of modern engineering design

ACCURACY—Toolmakers prefer the "OHIO" because perfect alignment is assured.

SPEED—Centralized control. Feeds and Speeds can be changed instantly.

POWER—A long crank arm with bullgear center above the center of crank arm gives the maximum power factor.

STRENGTH—This machine is doubly reinforced throughout, not only to give strength and long life, but also a maximum rigidity and the total elimination of chatter.

Constant Automatic Lubrication keeps all bearings flooded with oil.

Perfect Ram Alignment assured by square ram bearing, long ram gib, exceptionally long ram and ram bearing.

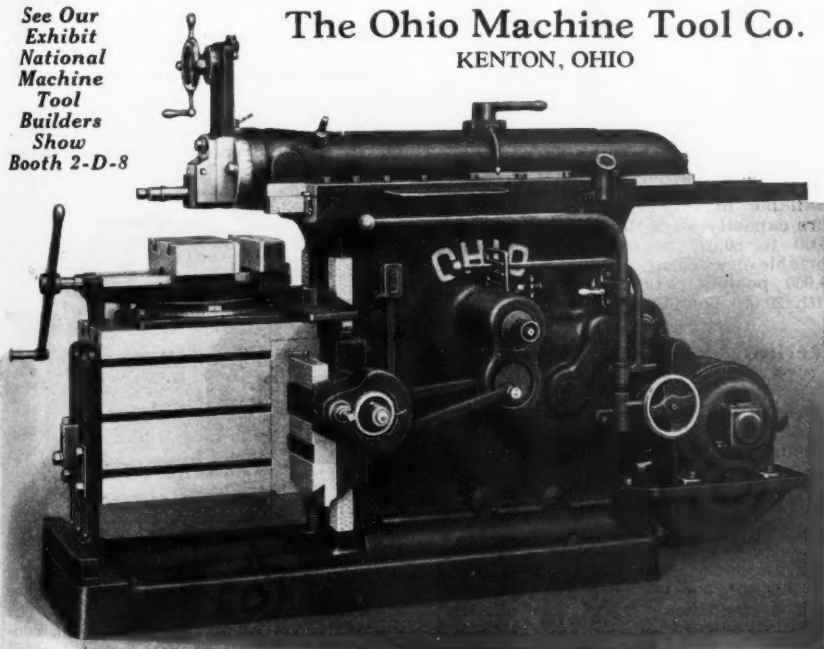
Table Alignment provided for by im-

proved table support and quick-acting jack, equalizing weight between rail and table support.

Convenience of Operation through centralized control. Clutch, speed change gears, and cone brake are controlled from operating position.

See Our
Exhibit
National
Machine
Tool
Builders
Show
Booth 2-D-8

The Ohio Machine Tool Co.
KENTON, OHIO



The Hannifin rivet press is built in two types, the horizontal type, available in eight sizes, and the vertical type,



Hannifin Vertical Type Rivet Press

available in thirteen sizes. The pressure capacity on both types ranges from 5,000 to 80,000 pounds. Two sizes of portable presses are available, one with 10,000 pounds pressure, and the other with 20,000 pounds pressure.

Peerless Model 30 Blue Printing Machine

The C. F. Pease Company, 855 North Franklin St., Chicago, Ill., has recently announced the development of the new "Peerless" Model "30" continuous blue printing machine, which they claim is capable of finishing blue prints at a maximum rate of 12 feet per minute. With this new model, tracings are laid face up on a continuous roll of paper feeding at the front of the machine, carried upward around a semi-circular, uniformly-curved segment of French plate glass, and past a glowing bank of

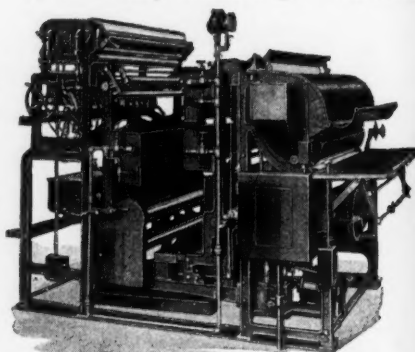
arc lamps which are individually mounted in horizontal alignment to give an intense light rich in actinic value.

After exposure the tracings are automatically deposited in a tray at the front of the machine, within easy reach of the operator, and the prints on the continuous roll are carried over the top roll of the machine, and passed down to a specially-designed atomized water wash.

From the water wash the prints pass over in contact with a special 4-inch rubber covered roll set in a shallow pan at the bottom of the machine, which applies a uniform coating of potash solution to the entire surface of the prints. Negative solution may be applied with this same roll in the same manner by a simple matter of feed tank adjustment without danger of dilution. The developed prints are again washed by another spray jet arrangement which gives them a final thorough cleansing, and then pass on to the final drying operation.

The dryer of the new "Model 30" consists of two chromium plated copper drums and an auxiliary air drying unit. The units are in graduated heat arrangement. Due to the direct roll contact with the paper, prints are dried perfectly smooth and free from wrinkles.

The Model "30" is equipped with a 1/4 h. p. variable speed motor, connected to a fully enclosed gear reduction

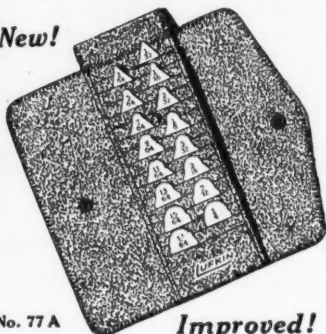


Peerless Model "30" Blue Printing Machine

unit running in oil, which gives the machine a speed range of from 4 inches to 12 feet per minute as required. The motor is controlled by a rheostat connected to a hand operated dial located

LUFKIN RADIUS GAGE

New!



No. 77 A

Improved!

Sixteen Gages, each marked with radius. External and internal form on same gage. Assembled in neat folder.

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THE LUFKIN RULE CO.

SAGINAW, MICH.



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A MIKE I CAN
DEPEND
ON

A micrometer which in the finest quality has an accuracy within .000075 per 1". Made by the makers of Swedish Gages, of materials that guarantee long life. Write for interesting booklet and prices.

PRECISION
MEASURING INSTRUMENTS
SWEDISH GAGE CO. OF AMERICA
7310 WOODWARD AVE., DETROIT, MICH.

AMERICAN V-2 Broaching Machine

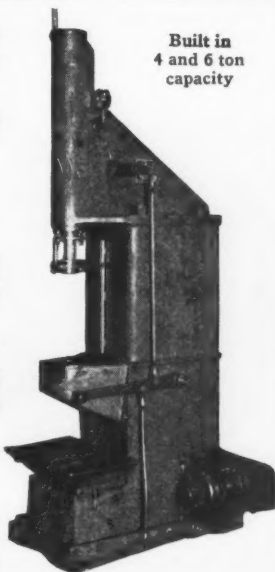
SMOOTH - POWERFUL
ACCURATE - PRICED RIGHT

HYDRAULIC PRESSURE is smooth acting, positive, and powerful—the ideal for accurate broaching. That is why the American V-2 Broaching Machine is equipped with hydraulic feed.

It gives the ram a steady, smooth, downward stroke, and at a speed of 20 feet per minute has enough reserve power, up to 6 tons, to complete the stroke at this speed. As soon as the stroke is completed the ram automatically returns to the starting position.

This feature and many others are completely described in our bulletin—write for it TODAY!

Built in
4 and 6 ton
capacity



The American Broach & Machine Co.

ANN ARBOR

MICHIGAN

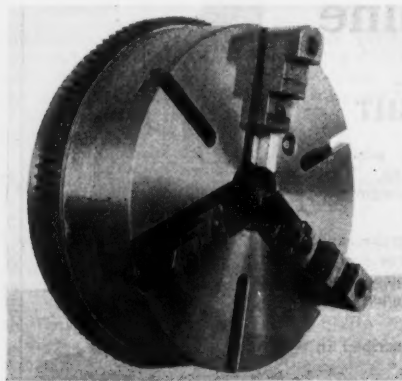
at the extreme right side of the feed table. Mounted at the extreme left side of the machine is a special four-point auto-type gear shift which provides for two forward speeds, high and low, neutral, and reverse. The reverse gear is a new feature in the construction of blueprinting machines and allows the operator to withdraw tracings at any time.

Two sizes of this machine are available—the 42-inch equipped with six lamps and the 54-inch equipped with seven lamps—either 110 volt or 220 volt, DC or 220 Volt AC. The lamps are the special type "P" and consume either $6\frac{1}{2}$ Amperes on DC, or $7\frac{1}{2}$ Amperes on A. C.

Union Electric Power Operating Chuck

The Union Manufacturing Company, New Britain, Conn., has recently placed on the market a line of electric chucks, the holding power of which is said to be at 100 per cent during the entire day as the tightening of jaws does not depend on the physical energy of the operator.

These chucks, either AC or DC, are furnished internally-operated for chucking work only, or externally-operated for both chucking work and bar work. The power pressure, controlled from 500 to 6,000 pounds, can be changed at the option of the operator in accordance



Union Electric Power Operating Chuck

with the work at hand. The internally-operated chuck is operated by push but-

ton control, and the externally-operated chuck by lever control which automatically opens and closes the jaws. These jaws can be used either at the maximum or minimum capacity of the chuck. The controls are conveniently arranged for either hand or foot operation.

The Union Electric Chuck can be furnished in five sizes—10-inch, 12-inch, 15-inch, 18-inch, and 22-inch—with either solid or reversible top jaws as required. The chucks are made of steel, and all the working parts are of chrome nickel heat-treated steel. The size of motor varies from $1/3$ to 1 h. p., according to the size of the chuck and the pressure required.

Hill-Curtis "Rite Speed" Polishing and Buffing Lathe

The illustration shows the new "Rite Speed" polishing and buffing lathe recently placed on the market by the



Hill-Curtis "Rite Speed" Polishing and Buffing Lathe

Hill-Curtis Company, of Kalamazoo, Mich. This machine is furnished either in the style shown, or with the overhanging type of spindle. The motor is mounted in the pedestal, and power is transmitted to the spindle by means of a multi V-type belt. Adjustments for taking up slack in belts are made from the outside, eliminating the possibility of getting the pulleys out of alignment. An automatic motor starter with over-

YOU ARE INVITED — TO BOOTH 5-C-8

UNION CHUCKS

FOR GREATER
EFFICIENCY

UNION HOISTS

at the National Machine Tool Builders' Show at Cleveland, September 30—October 4, inclusive.

Something entirely different in the line of UNION products will be on display, demonstrating greater labor savings for your plant. You will be surprised at the increased efficiency.

UNION MANUFACTURING CO.

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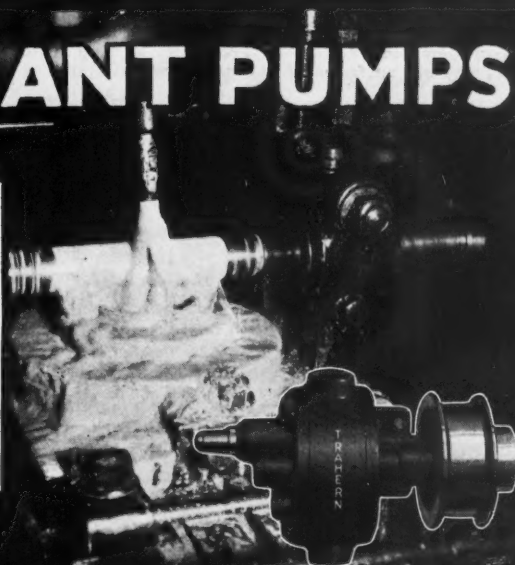
COOLANT PUMPS

TRAHERN

Constant lubrication to the moving parts, together with coolant liquid to cutting edges, reduces wear to a minimum and lengthens the life of the machine tools.

Pumps can be furnished with or without relief valves, for belt or motor drive—the flow always free from pulsation. Write for Catalog 54.

Geo. D. Roper Corp.
Rockford, Illinois



load protection is furnished as standard equipment.

An outstanding feature of the "Rite Speed" polishing and buffing lathe is the combination switch and brake. It is only necessary for the operator to pull the lever forward to switch off the current and apply the brake. The brake is released and the motor started by reversing this operation.

Belts can be changed very easily. All that is necessary is to relieve the belt tension by loosening the motor adjustment screw, remove the four large cap screws on each side of the spindle—which allows the entire spindle to be removed without disturbing the bearing mounting—and slip the belt off the spindle.

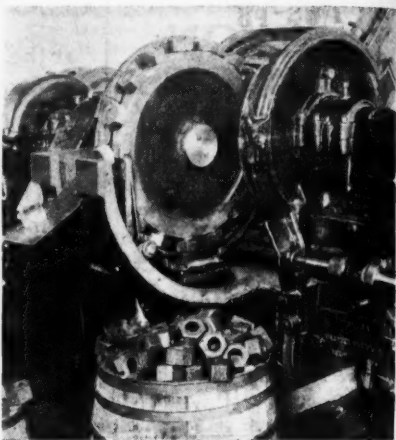
Gardner No. 84 Special Hexagon Nut Grinder

The Gardner Machine Company, Beloit, Wis., has developed a special hexagon nut grinder consisting of a No. 84 Gardner Grinder on the front of which is mounted a rotary attachment with special work carrier and timing device. Two guides keep the nuts from turning so that they come in contact with the grinding wheel in the proper position. An indexing device mounted on the top guide turns the nut 1/6 of a revolution as it passes, thus presenting two new surfaces to be ground.

After the six surfaces of the nut have

been ground, it is automatically ejected by two vertical arms, one on each side of the nut. They are timed so that the nut is allowed to pass through the wheel three times before being ejected.

In the operation of this machine, the

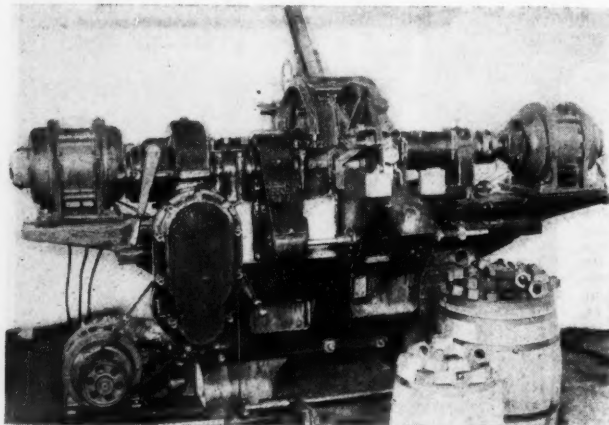


Ejecting Device, Gardner No. 84 Special Hexagon Nut Grinder

attendant is only required to keep the empty stud reloaded as it comes around to the loading position. In starting to load the machine when it is entirely empty, it is necessary for the operator

to watch the unloading arms and load only the stud from which the nut would have been ejected had there been one on it. The carrier becomes filled in three revolutions.

The machine is equipped with both a hand and foot lever connected with friction clutch for instantly stopping and starting the feeding mechanism. This makes it possible to stop the carrier instantly, if necessary, by simply stepping on the foot lever.



Gardner No. 84 Special Hexagon Nut Grinder.

Stuart Oils

FOR THE "TOUGHEST"
METAL WORKING CONDITIONS

The Unique
Ability of

Stuart's

Thred-Kut

(Pat'd Oct. 19, 1926)

Alloy Steel Cutting Oil

To "Smooth-Out" Tough Jobs

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you are in trouble.

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mailed upon request.*

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GET one of these amazing, non-leaking, free-swiveling, guaranteed Quick-As-Wink Hose Couplings on approval. Watch how it quadruples hose life—eliminates kinks—stands the hardest hammering or the roughest use and is not affected by mud, snow or ice.

One will be mailed to you without obligation—on approval—so that you may see for yourself how it will work on your own job. You will decrease maintenance cost, cut out delays and speed up actual work.

*Send For Free Trial
Today*

C. B. HUNT & SON

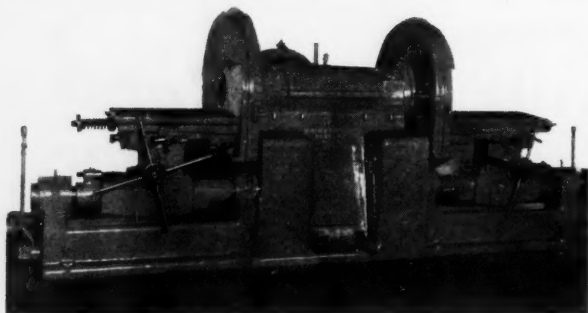
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The Famous Tobin Bronze

Quick-As-Wink

HOSE COUPLING

For Any Hose Connection



Gardner No. 9 40-Inch Super Disc Grinder

Gardner No. 9 40-Inch Super Disc Grinder

The new Gardner No. 9 40-inch super disc grinder, recently placed on the market by the Gardner Machine Co., Beloit, Wis., is said to handle, at rapid rates of production, much larger and heavier work than is possible on the average disc grinder.

It has a massive spindle measuring $5\frac{1}{8}$ inches in diameter at the bearings, on which is mounted two 40-inch steel wheels faced with heavy-type Gardner G. I. A. Discs, each rigidly supported by wheel flanges 29 inches in diameter. The spindle, mounted on huge Timken Bearings, is driven by spiral bevel gears enclosed in a grease-tight housing.

Mechanical means are provided for automatically rocking the two work tables, which are adjustably supported on a reinforced box section cast iron shaft, $3\frac{1}{2}$ inches in diameter at its ends, with sturdy outboard bearing housings supported on the floor for their full length. Each table may be operated independently of the other, or simultaneously, as desired. Oscillation of the work tables is quickly adjusted by conveniently-located hand and foot levers. The work is fed to the discs by spring tension.

The machine is driven either by belt or by a direct-connected motor of from 25 to 40 h. p. in size, depending upon the nature of the work to be ground. The weight is 16,000 pounds.

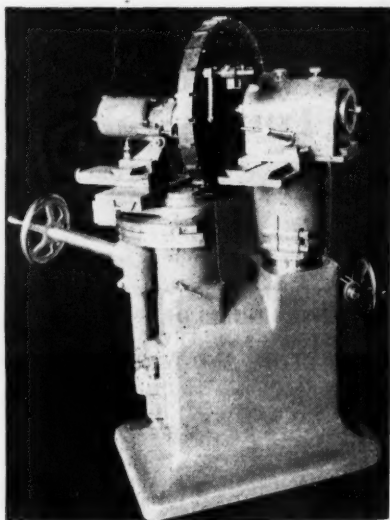
Oliver No. 2 "ARC" Face Mill Grinder

To meet the demand for a heavier type of machine for grinding large cutters

and face mills, the Oliver Instrument Company, Adrian, Mich., has developed the No. 2 "ARC" Face Mill Grinder shown in the illustration. The machine grinds face mills up to 26 inches diameter, with fine or coarse pitch blades, set either straight or helical and with any desired angle between face and periphery. Any desired peripheral clearance or any required corner-radius from a sharp

corner to a 2-inch radius can be obtained, the cutter being ground complete with one setting and with but one pass of the wheel.

The cutter is mounted on a spindle in exactly the same way that it is mounted in the milling machine where it is to be used, and the movements are so con-



Oliver No. 2 "ARC" Face Mill Grinder

trolled that a turn of the operating wheel causes the grinding wheel to traverse the face, turn the corner, and traverse the periphery in one continuous movement. It is moved on the slides until the corner of the tooth is over the

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so con-

Are You Prepared

to do any keyseating job up to 1 inch wide and 12 inches high?

The Davis Keyseater

is always ready for any keyseating job within those limits. The well known "Two-Minute-Set-Up" enables it to present a degree of "Preparedness" invaluable in a keyseater which must be constantly ready for special or production operations.

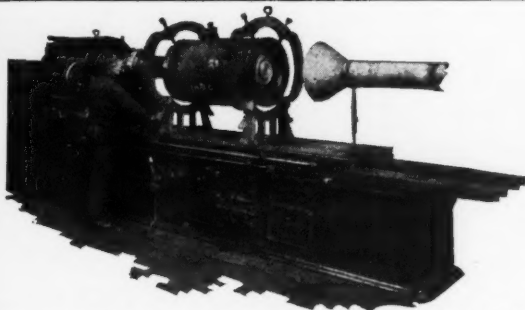
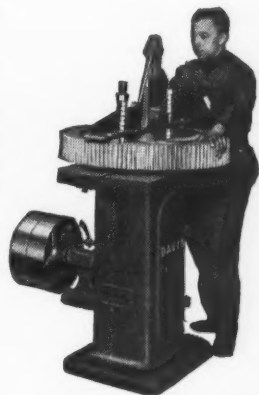
The simple, accurate operation, and rapid production insure profits on Davis Keyseating, on all classes of work.

**Be Prepared!
Send for Details!**

DAVIS KEYSEATER COMPANY

250 MILL STREET

ROCHESTER, N. Y.



Micro Model "HG" in the plant of the Bessemer Gas Engine Works, Grove City, Pennsylvania.

Once you have seen a MICRO Internal Grinder at work, you will agree with many others now using these machines—that a MICRO is indispensable equipment for grinding interiors of cylindrical surfaces with maximum precision and economy.

Let our engineers work with you on your internal grinding problems.

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MANUFACTURERS AND DESIGNERS OF
PRECISION GRINDERS
FOR ALL PURPOSES

Iowa, U-S-A

inder
erating
to tra-
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contin-
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ver the

center of rotation of the motor slide (set to a gage), and rigidly clamped in this position. The motor is then traversed around the cutting edge by means of the operating wheel.

The spindle has the new standard spindle nose adopted by the milling machine manufacturers, and revolves on Timken roller bearings of a size equal to those used in milling machines. The spindle bearing can be adjusted in three directions, providing for cutters of various diameters and widths, and for the desired clearance angles. The grinding wheel is direct-connected to the shaft of a powerful motor which is mounted so that it can be adjusted as desired. Power is supplied by a $\frac{3}{4}$ h. p. motor, operating at 3,600 r. p. m. This machine will be shown in operation in Booth 1-W-6 at the National Machine Tool Builders' Show at Cleveland.

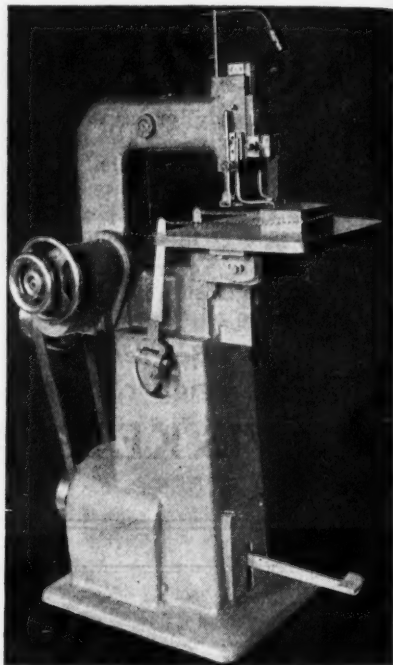
Oliver Heavy Duty Die Making Machine

Among the machines which the Oliver Instrument Company, of Adrian, Michigan, will have on exhibition in Booth 1-W-6, the National Machine Tool Builders' Show at Cleveland, September 30 to Oct. 4, is the new Oliver Heavy Duty Die Making Machine shown in the illustration. This machine is a precision machine tool for the rapid and accurate handling of dies, tools, and similar work.

The machine is adapted to both filing and sawing on work up to three inches thick, and has ample weight and power for the heaviest work. The table is 16 inches square and can be tilted in either of four directions. There is a clear distance of 16 inches back of the file. The stroke is adjustable from $\frac{1}{2}$ inch to 3 inches and six speeds are available through a cone and sliding gears.

The mechanism for holding and reciprocating the files consists of two large rams, one above and the other below the table, which are oscillated in unison. The saws and files are held accurately in line; files require no preparation whatever and saws of any type may be used. The hold-down fingers, saw guides, or other attachments are held to the upper ram housing where they are always in position and do not obstruct the table in any way. Feeding pressure is applied by means of a foot pedal and this pressure may be relieved on the up-stroke if desired.

All gears and mechanism for operating the rams are enclosed in an oil-tight body and a geared oil pump supplies



Oliver H. D. Die Making Machine

lubricant to all bearings except the rams. An air pump, enclosed in the body, provides an air blast ample to keep the work entirely clear of chips. Power is supplied by a 1-h. p. motor in the base of the machine, where it is protected from dust and filings.

Oliver No. 21 Drill Grinder

The No. 21 Oliver Drill Grinder shown in the illustration is one of the new machines which has been brought out by the Oliver Instrument Co., Adrian, Mich., and which will be exhibited in Booth 1-W-6 at the National Machine Tool Show in Cleveland, September 30 to October 6. This machine is of a special type for grinding drills of from $\frac{3}{32}$ to $\frac{1}{2}$ -inch, producing the Oliver type point when desired but also producing other types of points for countersinking, counterboring, chamfering, and so on. Thick-web oil hole drills

SHARP TOOLS CUT COSTS



Save Your Tools—

*By properly grinding them on
the GRAND RAPIDS TOOL
and CUTTER GRINDER*

Properly ground tools cut faster, stay sharp longer, and produce better work. All types of cutters can be accurately ground on this machine.

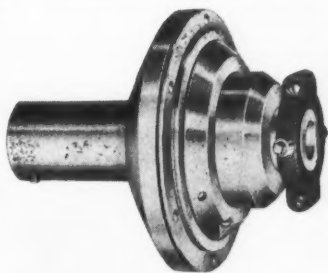
It is built with dual control for convenient operation from either front or rear of the machine. Self contained motor drive eliminates overhead shafting and belts.

Strong and rigid design insures satisfactory service by eliminating all vibration. It is built in five sizes arranged for either belt or motor drive, wet or dry grinding.

WRITE FOR BULLETIN

GALLMEYER & LIVINGSTON CO.

348 Straight Ave., S. W.
GRAND RAPIDS, MICH.



*Clutch trouble is
a thing of the
past.*

IT has no more place in your shop than the old town pump.

The Conway is a splendid clutch—it can be installed on any of your drives—and left to take care of itself.

Easy engagement—instant release—drag free idling—power capacity—micro-meter adjustment.

Can you imagine a sweeter symphony of start—go and stop than the coordination of these features.

It's husky—simple—attractive and entirely enclosed.

Surely—the Conway Disc is the last word in friction clutches.

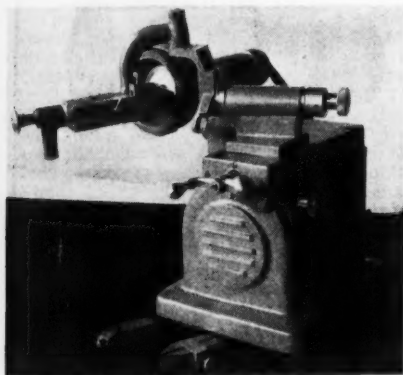


The Conway Clutch Co.

1959 W. 6th St., Cincinnati, Ohio

"It is a splendid Clutch"

can also be ground on this machine, the latter being ground on point and shoulder. In addition to grinding the cutting edge of the drill, the heel is



Oliver No. 21 Drill Grinder

backed off to provide more clearance for chips, resulting in smoother holes. The point angle can be varied from 60 degrees to 180 degrees, the smaller an-

gles being adapted for drilling wood, slate, fiber and similar materials.

The illustration shows the machine adapted for bench use. The motor is enclosed in the base and drives the spindle through a flat canvas belt, an idler providing the necessary tension. The spindle, which is mounted in a swinging frame, can be adjusted horizontally to obtain the desired amount of center clearance or undercut. Provision is also made for grinding shoulder drills, the point being ground in the usual manner and the wheel then being moved sideways for grinding the shoulder. A $\frac{3}{4}$ -h. p. motor in the base, where it is protected from dust and emery, provides power.

New Buffer Provides Range of Speeds

The need for a practical polishing and buffing machine that would provide different wheel speeds for different classes of work has been met by the development of the U. S. Multispeed Buffer and Polisher, which has been placed on the market by the United States Electrical

The PULLMORE Industrial CLUTCH



WOULD YOU CONSIDER—

EFFICIENCY which removes clutch troubles and complaints? The PULLMORE does!

ADAPTABILITY which permits clutch application on the most correct and approved principles? That's possible with the PULLMORE!

COMPACTNESS that reduces the necessary clutch space to a minimum without sacrificing efficiency? The PULLMORE is the smallest clutch made, capacity as a basis!

ADJUSTMENTS that are required very rarely but when necessary can be made with exceptional ease and no special tools? A screw driver is sufficient to make the finest adjustments which are few and far between on the PULLMORE!

PULLMORE CLUTCHES are built with capacities from 2 to 25 h. p. at 500 r. p. m., varying with the r. p. m., in single or double type to run dry, or in an oil bath. A trial installation will convince you!

INVESTIGATE these PULLMORE CLUTCHES at our Booth 2-W-25
N. M. T. B. Exposition, Cleveland, September 30 - October 4.

THE ROCKFORD DRILLING MACHINE CO.

Rockford, Ill.

ENGINEERING ———— DESIGNING

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and

SPECIAL MACHINERY

*Specialists In General Production and
Contract Work*

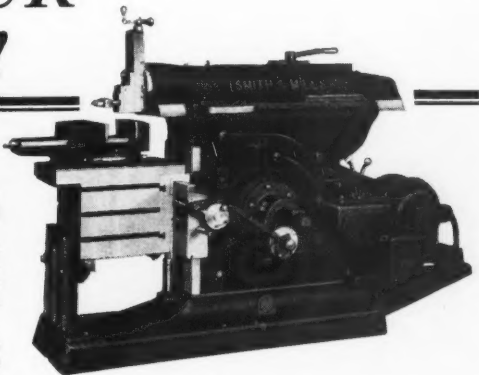
THE STEEL PRODUCTS ENGINEERING CO.
SPRINGFIELD, OHIO

CUT YOUR COSTS!

SMITH & MILLS HIGH SPEED CRANK SHAPERS

are designed for accurate work at high speeds. They shorten production time, which cuts your operating costs. Smith & Mills shapers are equally efficient on tool room or production work.

Smith & Mills modern improvements include "V" type ram with 55 degree ways, splined shafts, heat-treated alloy steel gears, speed box shafts mounted on Timken tapered roller bearings, Twin Disc Clutch, and one shot lubrication system.

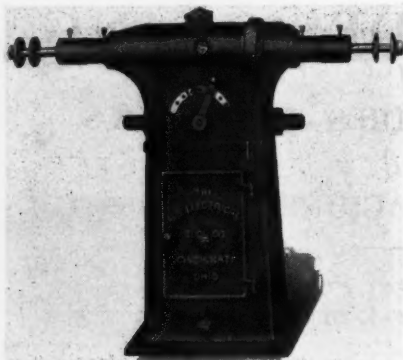


Made in 16, 20, 25 and 32-inch sizes
back geared; single-geared in 12
and 14-inch stroke.

WRITE FOR CATALOG!

THE SMITH & MILLS CO., Cincinnati, Ohio

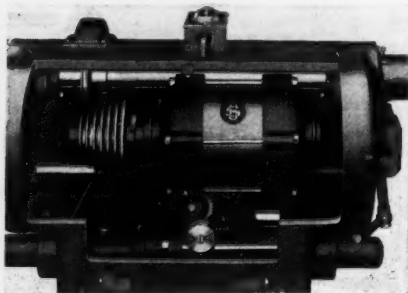
Tool Company, 2471 West Sixth Street, Cincinnati, Ohio. Any one of four speeds, ranging from 2,000 r. p. m. to 3,000 r. p. m. can be obtained quickly,



U. S. Multi-Speed Buffer and Polisher

the changes being accomplished by means of a Gibbs V-Disc transmission of graphitized micarta.

The transmission mechanism includes a series of discs of different sizes, revolving on the motor spindle. Any one of these discs, depending upon the speed required, can be quickly inserted into a stationary, metal V-disc of sheave mounted on the wheel spindle simply by releasing a cone and moving it into the desired position. The cone is released



Interior of Multi-Speed Buffer

by means of a foot pedal and the position is obtained by a lever. The motor and disc cone are mounted on a rocker arm so that they can be easily moved along the mounting, parallel with the wheel spindle.

Specifications show this buffer to em-

body a heavy one-piece chrome manganese steel wheel spindle, supported by four heavy duty SKF ball bearings, which are enclosed by labyrinth seal in dust-tight grease compartments. The motor is built for continuous service, is of 40-degree C. rating, with momentary overload capacity, and operates at 3,600 r. p. m. The control, which consists of a push button mounted within easy reach of the operator, is protected against overload and no-voltage release. The general design of the machine provides for balance and freedom from vibration. The machine is furnished in four sizes: 1, 2, 3, or 5 h. p.; 220, 440, or 550 volts, 2 or 3-phase, 25, 40, 50, or 60-cycle alternating current.

The machine will be exhibited at the National Machine Tool Builders' Exposition at Cleveland, Booth 1-A-15.

Improved Rapid Clamp

The Fountain Equipment & Manufacturing Co., 2025 Elm St., Cincinnati, Ohio, has improved its "Rapid" C-

clamp by using a double-tooth trigger instead of the single tooth. This double-tooth trigger is intended to give the clamp added strength, making it practically impossible to overload the clamp in the course of ordinary work. Aside from the instantaneous action, which is obtained by means of the trigger-release, the clamp is unusually rigid and is practically indestructible. This heavy-duty clamp is made in two sizes: 9 and 6 inches in length, both with double tooth engagement of the trigger.



Improved Rapid Clamp

Hannifin Improved Air-Operated Chuck

The equipment shown by the Hannifin Manufacturing Company, of Chicago, Ill., at the Machine Tool Show in Cleveland, September 30 to October 4, will include an improved air-operated chuck which, it is claimed, eliminates a source of trouble in the use of such chucks.

BOLENDER GEAR BURNISHER

*A New
C M & T
Product*



FOR BETTER RESULTS!

BURNISHING GEARS with a "BO-LENDER" Gear Burnisher produces a uniform size and finish, improves the accuracy of the gear, and burnishes all gears between 1½-inch and 8-inch diameter up to 11½ inches long.

The new design, the heavy rugged construction and the use of proper materials, coupled with a centralized control of all operating and adjusting members, insures better results by using the BOLENDER Gear Burnisher.

*Chamfering Machines,
Grinding Chucks*

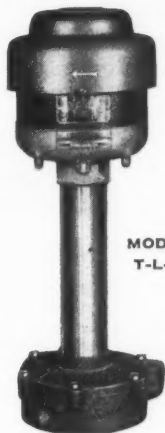
City Machine & Tool Works

5 North June Street

DAYTON

OHIO

"GUSHER" Coolant Pumps



MODEL
T-L-O

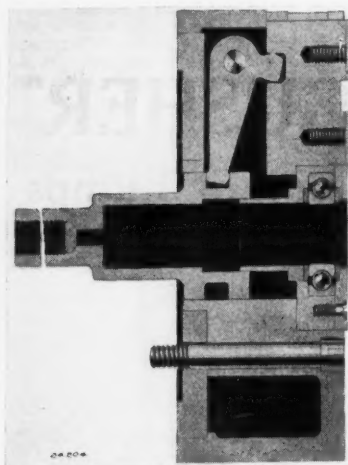
Unusual simplicity of
construction insures
longer and more
efficient service.

Write for Information

The Ruthman Machinery Co.

532 East Front Street

CINCINNATI, O.



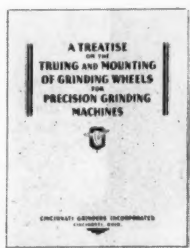
Hannifin Improved Air-Operated Chuck

Many boring operations are performed with tools that are piloted in the lathe chucks, and more or less trouble has been experienced as a result of dirt

finding its way in between the pilot and the bushing. The chuck shown in the illustration is equipped with ball bearing pilot bushings, the hole in the inner race of the bearing being ground to a close fit to accommodate the pilot of the boring tool. The inner race remains stationary while the outer race revolves with the chuck, this construction being intended to eliminate the possibility of dust working into the pilot bushing. The usual Hannifin high grade of workmanship and materials are features of this chuck.

Cincinnati Grinders, Inc., Issues Book On Grinding Wheels

As much of the success of precision grinding operations is dependent upon the correct truing and mounting of the grinding wheel, Cincinnati Grinders, Incorporated, Cincinnati, Ohio, has published a book entitled "A Treatise on the Truing and Mounting of Grinding Wheels for Precision Grinding Machines." The book includes chapters on "Mounting the Grinding Wheel on the Collet," "Mounting of Precision Grinding Wheels," "Wheel Truing," "Truing the Grinding and Regulating Wheels on the Centerless Grinder," "Available Means of Dressing Precision Grinding Wheels," "Mechanical Type Dressers," "Diamonds," and "Special Applications." Various types of wheel-truing equipment are described and illustrated, and illustrations are included with each chapter. A copy of the book will be sent free to any mechanical executive upon application.

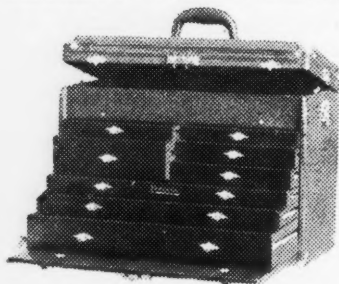


P. & L. E. Shops

(Continued from page 16)

ment. A 9-inch scrap driving axle of .55 carbon steel is cut to a length of 16 inches, and is then upset to a diameter of $1\frac{1}{2}$ inches by 8 inches thick, after which a $7\frac{3}{8}$ -inch hole is punched out of the center—all at one heat.

MACHINISTS AND TOOL-MAKERS TOOL CHESTS



Tool Chests that are right in construction and price.

Send for No. 25 Catalogue of Tool Chests and Tools.

WATERSTON'S

420 Woodward Avenue
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NIELSEN

Live Centers

Stand the "Gaff"

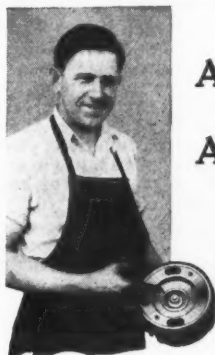


The stamina of NIELSEN Live Centers has been proven in a recent demonstration of tungsten carbide at the Case School of Applied Science.

A standard No. 6 NIELSEN Live Center was placed on a turret lathe equipped with a tungsten carbide cutting tool. A cut $\frac{3}{8}$ " deep with a feed of .037" per revolution was taken in cast iron at a cutting speed of 500 surface feet per minute. The center stood up under this cutting load without chatter and showed no sign of breaking down or burning.

There is a NIELSEN Live Center for every center requirement—write for bulletin.

NIELSEN, Inc.
LAWTON, MICH.



**This
Amazing
New
Abrasive
Wheel
Cuts
Buffing
Costs
50%**

THE time consuming disadvantages of rag buffs—the reconditioning and glueing on of grain—completely done away with in this high speed Quick-As-Wink abrasive wheel. Uses specially clipped strips of abrasive cloth, speeding up work, saving shop time and eliminating idle wheel costs to such an extent that factories, nation-wide, have effected a 50 per cent operating savings by its use.

Abrasive Strips of Any Grain Changed In 30 Seconds

Its speed of operation permits any grade of abrasive cloth to be used efficiently. Total width of surface is constantly utilized. The mechanism so simple and abrasive strips so convenient that a new buffing surface can be completely put on in 30 seconds.

Operates at 3450 R. P. M. Safe At Over 6000 R. P. M.

Its normal operating speed is 3450 R. P. M. Each wheel is tested before sale at 8000 R. P. M. Wheel is absolutely unbreakable and cloth strips will not burst or fly off at any operating speed. Every wheel perfectly safe, balanced and guaranteed.

Write For Detailed Description

Manufactured in 6 and 8 inch diameter with $2\frac{1}{2}$ inch face to any arbor size. Details of construction, price and complete information mailed to you without obligation. If possible send sample of finished and unfinished work with your inquiry.

C. B. HUNT & SON

639 McKinley Ave.

Salem, Ohio

Quick-As-Wink
BUFFING WHEEL

Lehmann Gear Lapping Machine

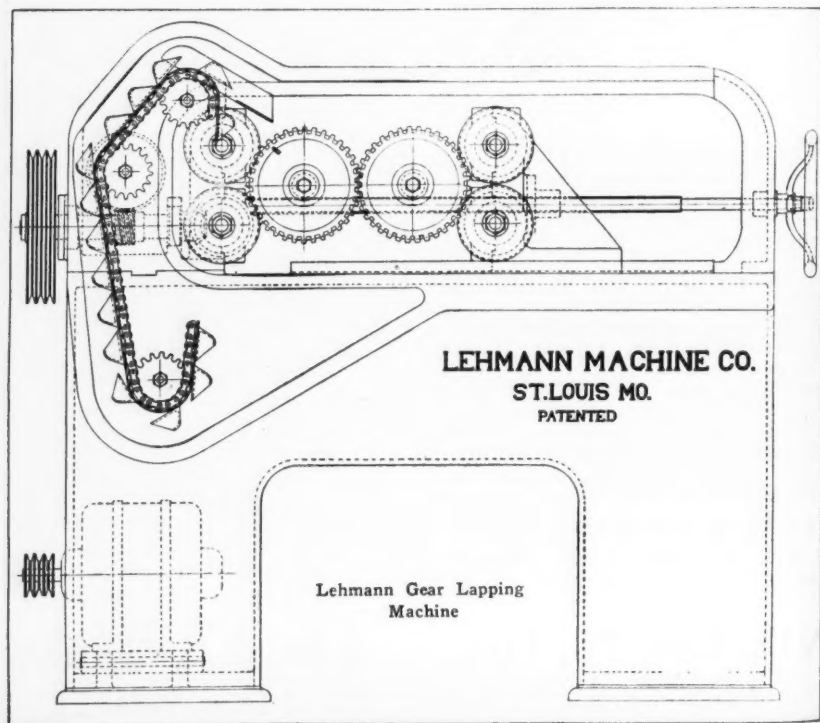
A machine with which gears can be lapped to the shapes necessary for smooth-running qualities has been developed by the Lehmann Machine Company, 3560 Choteau Ave., St. Louis, Mo. The machine is of simple, though effective, design, its functions being based upon corrective abrasion governed by the restraining movements of round discs under pressure contact.

The machine consists primarily of two spindles upon the outer ends of which the gears to be lapped are secured. The spindles carry hardened friction rolls of the exact pitch diameter of the gears being lapped and are driven by contact with rolls on the driving spindles of the machine, two of these driving spindles being journaled in a head which can be adjusted to bring the gear-carry spindles together until the hardened rolls are under pressure contact and the

position of the gears in process is limited to the correct center distance. The pressure on the discs, necessary for the desired effect, reacts on eight large ball bearings in which the friction rolls are journaled.

Oil and abrasive are fed to the gears being lapped, and while the gears govern the general relative movement, the discs resist any departure from the regularity of movement. The result is that all irregularities are removed by abrasion while the correct pitch diameter is maintained by the discs. Reversal of the direction of rotation produces the same result on both sides of the gears. The gears are quickly put on and removed, and one operator can take care of several machines.

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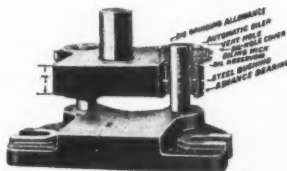


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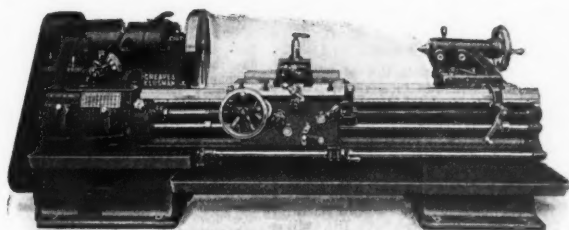
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Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-feeding, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kibbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by this company. Sent free upon request.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

Bradford Unit Type Drill Heads and Tapping Heads are described and illustrated in a bulletin published by the Bradford Machine Tool Co., 659 Evans Street, Cincinnati, Ohio. The bulletin also describes useful applications of these heads.

How to Sharpen Cutters: A series of leaflets, which describe and illustrate the correct methods to employ in sharpening all kinds of cutters, can be obtained, without charge, by addressing Brown & Sharpe Mfg. Co., Providence, R. I.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

"A Treatise on the Truing and Mounting of Grinding Wheels for Precision Grinding Machines" is the title of a book that has been published for mechanical executives by Cincinnati Grinders, Inc., Cincinnati, Ohio. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planer, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Shaper Progress: An illustrated catalog describing the various types of shapers made by the Cincinnati Shaper Co., Cincinnati, Ohio, and including descriptions of Cincinnati shapers in use in different kinds of plants.

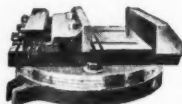
Bolender Gear Burnisher: The latest methods of burnishing gears for accuracy and silence are described in a booklet that has been issued by the City Machine & Tool Works, 5 N. June St., Dayton, Ohio. Copy free upon request.

Handbook for Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

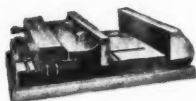
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Square Base

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6 R	\$48.00	7	1 1/4	3 1/2	10	11 1/4	77
8 R	61.00	9	1 1/2	5	11 1/2	14	95
10 R	76.00	11	2 1/4	6	14	17	165
12 R	93.00	13	2 3/4	8	16	20	220
15 R	120.00	15 1/2	2 1/2	9 1/2	20	24	310
18 R	155.00	18 1/2	2 3/4	11 1/4	22	27 1/4	442
24 R	220.00	24 1/2	2 3/4	16	26	33 1/2	722
30 R	320.00	30 3/4	3	21 1/2	33	42	1200

Square Base

Size Chk. No.	List Price	Lgth. of Jaw In.	Dpth. of Jaw In.	Jaws Will Open In.	Space Required Inches	Apprx. Ship. Wgt. Lbs.
6 S	\$37.00	7	1 1/4	3 1/2	7 1/4 x 11	55
8 S	43.00	9	1 1/2	5	9 x 12 1/2	68
10 S	51.00	11	2 1/4	6	11 x 15	110
12 S	64.00	13	2 3/4	8	13 x 17	157
15 S	87.00	15 1/2	2 1/2	9 1/2	15 1/2 x 21	234
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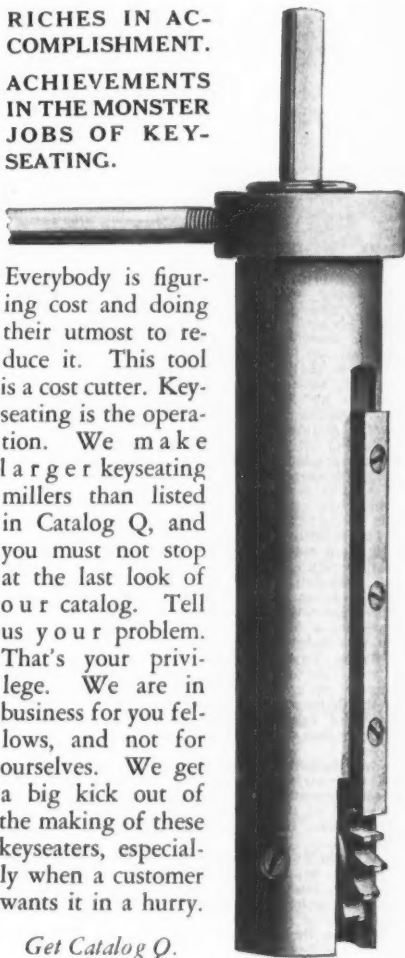
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are described in a book that is issued by the Dany Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Quantity Drilling: A semi-automatic multiple spindle drilling machine which is designed to produce the maximum of drilled holes in medium or small parts, is described in a pamphlet that is published by the Detroit Machine Tool Co., 5055 Woodward Ave., Detroit, Michigan. Sent free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Interchangeable Counterbore Co., 7410 St. Aubin St., Detroit, Michigan, describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

Silent, Self-Lubricating Gears for use in all kinds of machines are described in a booklet that can be had upon application to Fibroc Insulation Company, Valparaiso, Indiana.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Quick-Acting Clamp: A bulletin describing the "Rapid" drop-forged steel clamp manufactured by the Fountain Equipment & Mfg. Co., 2025 Elm St., Cincinnati, Ohio, has been issued by this firm.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Galmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Flat Surface Grinding: Automatic, semi-automatic, and single-purpose machines for performing all kinds of grinding operations on flat surfaces are described and illustrated in a book that has been issued by the Gardner Machine Company, Beloit, Wis. Copy free upon application.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Precision Horizontal Boring, Drilling and Milling: The Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has issued a series of bulletins describing the various kinds of horizontal boring, drilling and milling operations which may be performed with the machines made by this company. Copy free upon request.

1500 Good Tools: The 1500 tools of various kinds that are made by the Goodell-Pratt Company, Greenfield, Mass., are described and illustrated in a Tool Hand-

book that has been issued by this firm. Copy free upon request.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Air Is Your Best Helper: Air will operate your presses, chucks, vise jaws, and other tools more efficiently and at less cost. Catalog MS-11, issued by the Hamilton Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill., will show you how it is done. Ask for a copy.

Grinding, Polishing and Buffing Machines of the latest types are described and illustrated in a series of bulletins that have been issued by the Hill-Curtis Company, Kalamazoo, Michigan. Copies free upon request.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

"Quick-As-Wink" Buffing Wheels that eliminate all disadvantages of rag-buffs, speed output, do better work, and cut buffing costs to the minimum are described in a bulletin that is issued free by C. B. Hunt & Son, 639 McKinley Ave., Salem, Ohio.

Internal Grinding Equipment: The latest equipment for grinding holes of all sizes, from small wrist pin holes to the holes in locomotive cylinders, is described and illustrated in a booklet that will be sent free by the Hutto Engineering Co., Inc., 542 Lacleave Ave., Detroit, Michigan.

"Do It Electrically": The complete line of "Thor" universal electric tools, including tools for drilling, reaming, screw-driving, tapping, nut-setting, grinding, and for performing other operations is described in Catalog No. 17, issued free by the Independent Pneumatic Tool Co., 236 S. Jefferson St., Chicago, Ill.

Special Mil-Waukee-Mills of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Standardized Jigs and Fixtures: Information concerning standardized jigs and fixtures, also all kinds of special equipment for production, can be had by writing to H. E. Krueger & Co., 439 East Fort St., Detroit, Mich.

Cutter and Tool Grinding: A book that tells how to grind tools and cutters accurately and which also describes and illustrates the different types of LeBlond Universal Tool Room Grinders will be sent free upon request. Address, The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines is save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCroskey equipment is told in a book that is issued by the McCroskey Tool Corporation, Meadville, Penna. Will be sent without charge.

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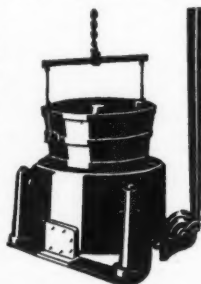
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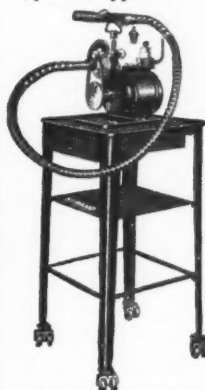
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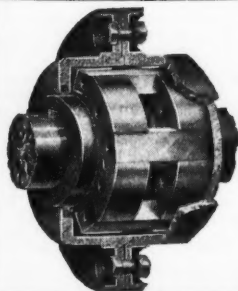
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"The 'Hole' Story in One Word" is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Nato" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

Grinding Wheel Information: A booklet which tells how grinding wheels are made and graded, and which give instructions for mounting wheels, operating speeds for different kinds of work, instructions for truing and dressing, and other information has been issued by the Norton Company, Worcester, Mass. Sent free upon request.

Correct Cutter Grinding: How cutter costs can be reduced and more production per grind of cutter obtained is told in Booklet "E," published by The Oesterlein Machine Co., 3319 Colerain Ave., Cincinnati, Ohio. Sent free upon request.

"Ohio" Shapers and Planers: The latest types of shapers and planers manufactured by The Ohio Machine Tool Co., Kenton, Ohio, are described and illustrated in a series of bulletins that have been issued by this firm. All the latest features of these machines, such as automatic lubrication, instantaneous feed, centralized control, and gear box, are described in detail. Free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1450 Maumee Street, Adrian, Mich. Mailed upon request.

Self-Tapping Sheet Metal Screws: Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St., New York City, N. Y. Sent free upon request.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Proconer Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Proconer tools play in obtaining greater accuracy and less tap breakage.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Kahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Pulmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Universal Oppside Shaper-Planer: The need of a machine tool to fill the gap between the shaper and the planer has been filled by the development of the Rockford Universal Oppside Shaper-Planer, made by the Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill. Full description on request.

Complete Pump Information: The Geo. D. Roper Corporation, Rockford, Ill., has compiled a catalog which is arranged so that the prospective user of a pump can immediately determine the size and model of pump that is best suited to his need. Copy free upon request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Safety Grinding Wheels: The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-Em-Up" drill sleeve, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 38, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Equipment For the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

"Metal Cutting" is the title of the book that describes the latest methods of cutting metals, and includes descriptions and illustrations of both the band saws and inserted-tooth metal-cutting saws made by the Simonds Saws & Steel Co., Fitchburg, Mass. Copy will be sent free upon application to the firm mentioned.

"Chucks and Their Uses" is the name of a book which contains a full description of the different kinds of chucks and suggestions for the proper care of chucks, and tells how chucks should be fitted to lathes. It also contains a number of suggestions for general shop practice. Sent free upon application by The Skinner Chuck Co., New Britain, Conn.

Shaping with Modern Equipment: The Smith & Mills Company, 2889-91 Spring Grove Avenue, Cincinnati, Ohio, has issued a booklet which describes and illustrates the line of modern shaping equipment made by this firm. Copy free upon request.

Cutting Oil Data: A series of booklets containing valuable information about cutting oils and their uses for thread-cutting, broaching, and general cutting purposes will be sent free to any mechanical executive by D. A. Stuart & Co., 2727 South Troy St., Chicago, Illinois.

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.



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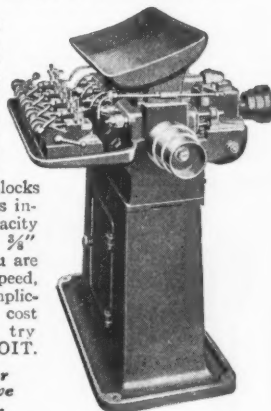
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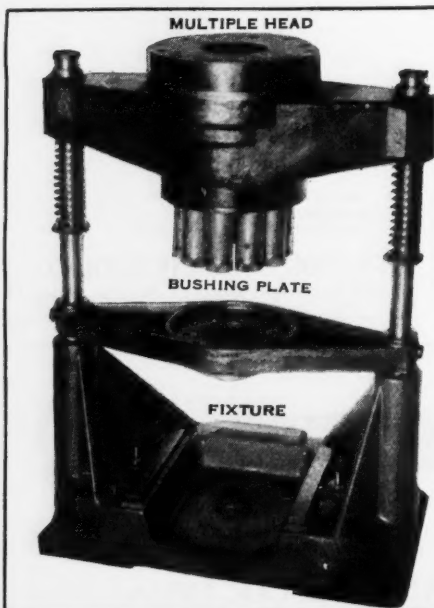
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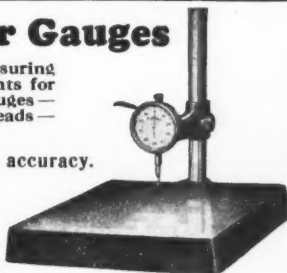
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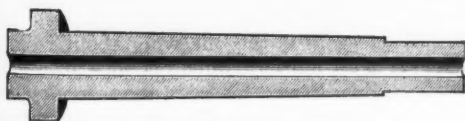
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Riff=Raff Ravings

By PHILIP McCANN
Raver-in-Chief

They said she was the janitor's daughter, but the elevator man brought her up!

The first time a Scotchman used free air in a gas station, he blew out four tires.

St. Peter was interviewing the fair damsel at the pearly gate. "Did you, while on earth," he asked, "indulge in necking, petting, smoking, drinking or dancing?"

"Never," she replied, emphatically.

"Then why haven't you reported here sooner?" said St. Peter. "You've been dead a long time."

Mother—Now, Willie, I want you to go in and get acquainted with the new nurse and kiss her nice.

Willie—Yes! and get my face slapped, like papa did.

Rastus was looking for work, and the employer was asking him the usual questions.

"What's your name?"

"Erastus Johnson, suh."

"How old are you?"

"Ah is twenty-nine yeahs, suh."

"Are you married?"

"No suh. Dat scar on mah head is where a mule kicked me."

Save the Surface

Sam—"Why is it that statistics show that women live longer than men?"

Abe—"Well, you know paint is a great preservative."

Male voice (over phone): "Guess who this is."

Flapper: "Make a noise like a kiss."

There was a young girl named O'Neil,
Who went up in a big Ferris wheel;

But when half way around.

She looked at the ground,
And it cost her an eighty-cent meal.

Some Combination

He—"Wonderful night, a beautiful girl—what a combination."

She—"Heavens, is that showing, too?"

The cream of absent-minded professors is the one who, about to start on a journey, filled his wife with gasoline, kissed his road map goodbye, and tried to shove his car into his pocket.

I eat my peas with honey,
I've done it all my life;

It makes the peas taste funny,
But it keeps them on the knife.